DOCUMENT RESUME

ED 034 417 EM 007 580

AUTHOR	Rostow, Eugene V.
TITLE	President's Task Force on Communications Policy. Final Report.
INSTITUTION	President's Task Force on Communications Policy, Washington, D.C.
PUB DATE	7 Dec 68
NOTE	508p.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (GPO 0-351-636, $4.50)
EDRS PRICE	EDRS Price MF-$2.00 HC Not Available from EDRS.
DESCRIPTORS	Administrative Policy, *Agencies, *Communications, Communication Satellites, Government (Administrative Body), *Government Role, Mass Media, *Media Technology, Networks, Radio, Technological Advancement, Telecommunication, Telephone Communications Industry, Television, Utilities
IDENTIFIERS	FCC, Federal Communications Commission

ABSTRACT

The final report of the President's Task Force on Communications Policy recommends strengthened federal powers to form public policy in telecommunications. Such planned policy would enable the private sector to reach its full capacities in the field by improving regulation when it is necessary and removing unnecessary regulation. Monopoly of telecommunications facilities should remain the exception, not the rule, so as to provide maximal consumer satisfaction and technological advancement. New powers should be given to the FCC, and a new agency should be created for formulating long-range communications policy. The report is organized around the subjects of the staff papers: the international telecommunications industry (combining of cable and satellite interests is recommended); INTELSAT; needs of less developed countries; domestic satellite use (pilot projects should precede final policy decisions); structure and regulation of the domestic carrier industry; the future of television (relaxation of restrictions, so as to allow cable TV to develop); spectrum use and management (greater flexibility); and the government's role in general. (BB)

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FINAL REPORT

PRESIDENT'S TASK FORCE ON COMMUNICATIONS POLICY

December 7, 1968

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FINAL REPORT

President's Task Force on Communications Policy

Established Pursuant to the President's

Message on Communications Policy,

August 14, 1967

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UNDER SECRETARY OF STATE
FOR POLITICAL AFFAIRS
WASHINGTON

December 7, 1968

The President,
The White House.

Dear Mr. President,

We have the honor to present herewith the Report required by your Message on Communications Policy of August 14, 1967.*

That message called for a review of past activities in the field, and the formulation of a national communications policy.

To that end, you announced the appointment of this Task Force "to make a comprehensive study of communications policy."

Your Message of August 14, 1967, requested our study to be submitted within a year. Later, you extended that date to December 31, 1968.

Fifteen Departments and agencies** of the Federal Government have cooperated directly in the Task Force effort.

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* Reprinted as an Appendix.

** Department of State, Department of Defense, Department of Justice, Department of Commerce, Department of Labor, Department of Health, Education and Welfare, Department of Housing and Urban Development, Department of Transportation, United States Information Agency, National Aeronautics and Space Administration, Bureau of the Budget, Council of Economic Advisers, Office of Science and Technology, National Aeronautics and Space Council, Office of Telecommunications Management.

The participation of the Federal Communications Commission (FCC) had a special character. In the nature of the Commission's statutory responsibilities, Chairman Hyde's service on the Task Force was necessarily ex-officio, and nothing in this Report should be construed as reflecting the views of the FCC. Within the limits of that principle, however, Chairman Hyde, his colleagues, and the staff of the Commission have cooperated fully and constructively in the studies and consultations on which this Report is based. Their contribution is gratefully acknowledged.

In addition to the direct participants and the FCC, valuable assistance was also received from other government agencies, from private industry and from the academic community.

A small staff supplemented these resources with its own independent research and the documents produced under eight special research contracts. A comprehensive series of staff papers, research reports and appendices were prepared. The Task Force has not passed upon or approved these documents, but they proved useful in our deliberations, and in the preparation of this Report.

A particular debt of gratitude is owed to Mr. Alan Novak, Staff Director, and to the able group of associates, consultants, and advisers he assembled. Their work was distinguished both in intellectual quality and in its acute sense of policy. And they understood and wholeheartedly accepted the spirit of compromise without which it would have been impossible to accomplish the task you set us.

Communications policy is a complex subject on which reasonable men can and do differ, and differ strongly. No member of the Task Force would have written the Report in the form in which we submit it. Most would have preferred the Report to say more, or less, on almost every topic discussed. But all understood the importance of achieving a

Report which included the ideas and recommendations on which we could agree. We are gratified that taken together our statement outlines what we consider to be a suitable framework for a national communications policy -- a policy which could further the great goal of using communications technology to advance understanding and conciliation, at home and abroad.

Statements of partial dissent by Gen. James D. O'Connell, and by Joseph Bartlett, appear in the Appendix. Notations of dissent on several particular points by Dr. Edward G. Welsh are appended to the text.

With respect and regard,

Yours sincerely,

Eugene V. Rostow

PRESIDENT'S TASK FORCE ON COMMUNICATIONS POLICY

EUGENE V. ROSTOW - Chairman
Under Secretary of State for Political Affairs
Department of State

JAMES D. O'CONNELL - Vice Chairman
Director of Telecommunications Management

ANTHONY M. SOLOMON
Assistant Secretary of State
Bureau of Economic Affairs
Department of State

SOLIS HORWITZ
Assistant Secretary for Administration
Department of Defense

DONALD F. TURNER
(replaced by)
EDWARD M. ZIMMERMAN (June, 1968)
Assistant Attorney General
Antitrust Division
Department of Justice

J. HERBERT HOLLOMAN
(replaced by)
JOHN F. KINCAID (September, 1967)
(replaced by)
JOSEPH BARTLETT (September, 1968)
Under Secretary
Department of Commerce

JAMES J. REYNOLDS
Under Secretary
Department of Labor

DEAN W. COSTON
Deputy Under Secretary
Department of Health, Education and Welfare

ROBERT C. WOOD
Under Secretary
Department of Housing and Urban Development

DONALD G. AGGER
Assistant Secretary for International Affairs
and Special Programs
Department of Transportation

LEONARD H. MARKS*
Director
United States Information Agency

JAMES E. WEBB
(represented by)
WILLIS H. SHAPLEY
Associate Deputy Administrator
National Aeronautics and Space Administration

CHARLES SCHULTZE
(replaced by)
CHARLES ZWICK (January, 1968)
Director
Bureau of the Budget

GARDNER ACKLEY
(replaced by)
MERTON J. PECK (February, 1968)
Council of Economic Advisers

DR. DONALD F. HORNIG
Director
Office of Science and Technology

EDWARD G. WELSH
Executive Secretary
National Aeronautics and Space Council

ROSEL HYDE - Ex Officio
Chairman
Federal Communications Commission

ALAN R. NOVAK - Executive Director

---

* Mr. Marks submitted his resignation as Director of USIA as of November 4, 1968, and did not thereafter participate in the deliberations of the Task Force.

ACKNOWLEDGMENTS

Neither the central staff nor the Task Force itself could have performed their duties without the invaluable assistance of many others. Although it would not be practical to list the names of all individual sources of important assistance, the contributions of our outside consultants, our research contractors, */ the academic community, representatives of numerous firms within the communications industry, and a host of groups interested in various aspects of telecommunications were all of invaluable assistance and are gratefully acknowledged.

Particular appreciation is due the staff of the FCC, who gave unstintingly of their time, and whose

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*/ Complan Associates, Inc.
Page Communications Engineers, Inc.
Stanford Research Institute
Kelly Scientific Corporation
RAND Corporation
Spindletop Research
TEMPO-General Electric
Committee on Telecommunications Policy, National Academy of Engineering
While the NAE panel was an important source of criticism and advice, their participation should not be implied as endorsement of any portion of the Task Force work.

participation, while on an ex officio basis, was critical to the development of data and concepts important to the final report. By the same token, special recognition should be given to the contributions of the staff representatives of the various participating Departments and Agencies.

Task Force Staff

NOVAK, Alan R.	Staff Director (from the Office of the Under Secretary of State)
JOHNSON, Leland L.	Director of Research (from the RAND Corporation)
POSNER, Richard A.	General Counsel (from the Solicitor General's Office, Department of Justice)
GRAY, Oscar (Jan. 68 - Aug. 68)	Counsel (from Department of Transportation)
HINCHMAN, Walter	Physicist/Systems Engineer (from Office of Telecommunications Management)
LASHER, Sebastian (Lt. Col.) (July 68 - Sept. 68)	Communications Engineer (from Department of Defense)
OSBORN, Charles	Systems Analyst (from Department of Defense)
SHERIDAN, James	Economist (from Federal Communications Commission; formerly Chief of FCC Broadcast Bureau)
STARR, Robert	Counsel (from Department of Health, Education and Welfare)
HICKS, Orton (Dec. 67 - May 68)	Research Librarian (from United States Information Agency)
LYONS, William N. (April 68 - Jan. 69)	Research Librarian (from United States Information Agency)

Staff Representatives

ARMSTRONG, Cole	Office of Telecommunications Management
BAKER, Donald	Chief, Evaluation Section, Antitrust Division, Department of Justice
BERG, Capt. Winfred E.	National Aeronautics and Space Council
CLARK, Ralph	Office of Telecommunications Management
DAVIS, Dr. Ruth M.	National Library of Medicine National Institutes of Health
DREW, Dr. Russel C.	Office of Science and Technology
GENTRY, John N.	Executive Assistant to the Under Secretary of State
GOLOVIN, Nicholas	Technical Assistant Office of Science and Technology
KESTENBAUM, Lionel	Department of Justice
LOWE, Robert	Department of Transportation
LOY, Frank E.	Deputy Assistant Secretary for Transportation and Telecommunications Department of State
LYONS, Dr. William N.	Foreign Service Reserve Office United States Information Agency
MORRILL, William	Bureau of the Budget
NELSON, Thomas E.	Acting Director, Office of Telecommunications Department of State
NOLL, Roger	Senior Economist Council of Economic Advisers
OMBERG, Arthur	Department of Commerce
OSER, Hans	Department of Commerce
RADIUS, Dr. Walter	Office of DOD and Interagency Affairs National Aeronautics and Space Administration

ROGERS, Thomas	Director Office of Urban Technology and Research Department of Housing and Urban Development
SOLOMON, David L.	Technical Adviser, National Communications Office of Secretary of Defense
ZUCCOTTI, John E.	Special Assistant to the Under Secretary Department of Housing and Urban Development

Consultants

ALEXANDER, Sidney	Massachusetts Institute of Technology Cambridge, Massachusetts
BARNETT, Harold	Washington University St. Louis, Missouri
BARNETT, Stephen R.	University of California
BAUMOL, William J.	Princeton University Princeton, New Jersey
BAXTER, William F.	Stanford University Stanford, California
BLOCK, Clifford	Agency for International Development Washington, D.C.
BOLTON, Roger E.	Williams College Williamstown, Massachusetts
CAPRON, William	Brookings Institution Washington, D.C.
CHAYES, Abram	Harvard University Cambridge, Massachusetts
CHAZEN, Leonard M.	Rutgers University Newark, New Jersey
CLAYTON, John	Department of Health, Education and Welfare Washington, D.C.
DEUTSCH, Jan G.	Yale University New Haven, Connecticut
DUGGAN, Michael A.	University of New Hampshire Durham, New Hampshire
EHRLICH, Thomas	Stanford University Stanford, California
EINHORN, Henry	Department of Commerce Washington, D.C.
ELDRIDGE, Frank R.	Research Analysis Corporation McLean, Virginia

FISHER, Thomas	Office of Telecommunications Management Washington, D.C.
GARDINER, John R.	Writer Washington, D.C.
GREENBERG, Edward	Washington University St. Louis, Missouri
HOLBORN, Frederick	Writer Washington, D.C.
HUSZACH, Fredrick W.	American University Washington, D.C.
IRWIN, Manley R.	University of New Hampshire Durham, New Hampshire
JONES, William K.	Columbia University New York, New York
LAZARUS, Simon, III	Lawyer Washington, D.C.
MATHISON, Stuart	Massachusetts Institute of Technology Cambridge, Massachusetts
MEYERS, Charles J.	Stanford University Stanford, California
MORRIS, Fred W., Jr.	Telecommunications Consultant Washington, D.C.
NEISSER, Albert	Federal Communications Commission Washington, D.C.
PRICE, Monroe E.	University of California (UCLA) Los Angeles, California
ROSS, Leonard M.	Yale University New Haven, Connecticut
SCHARFF, Samuel A.	Consulting Engineer Englewood, New Jersey
SCHWARTZ, Herman	State University of New York Buffalo, New York

STONE, Christopher D.	University of Southern California Los Angeles, California
TAYLOR, Lester D.	Harvard University Cambridge, Massachusetts
TREBING, Harry M.	Michigan State University East Lansing, Michigan
WALKER, Philip M.	Massachusetts Institue of Technology Cambridge, Massachusetts

METROPOLITAN SPECTRUM CONGESTION TASK GROUP

HAYDON, GEORGE W. (Chairman)	Institute for Telecommunications Sciences Department of Commerce Boulder, Colorado
BROOKS, CHARLES A.	Federal Aviation Administration Washington, D. C.
CUTTS, ROBERT L.	Federal Communications Commission Washington, D. C.
PROBST, SAMUEL E.	Defense Communications Agency Washington, D. C.
RAISH, LEONARD R. (Capt.)	Office of Telecommunications Management Washington, D. C.

NATIONAL ACADEMY OF ENGINEERING

Committee on Telecommunications Policy

EVERITT, Dean William L.	Chairman College of Engineering University of Illinois at Urbana 106 Engineering Hall Urbana, Illinois 61801
PIORE, Dr. Emanuel R.	Vice Chairman Vice President and Chief Scientist International Business Machines Corporation Armonk, New York 10504
WEBER, Dr. Ernst	President Polytechnic Institute of Brooklyn Brooklyn, New York
BUSIGNIES, Dr. Henri G.	Senior Vice President and Chief Scientist International Telephone and Telegraph Corporation 320 Park Avenue New York, New York 10022
HILLIER, Dr. James	Vice President RCA Laboratories Radio Corporation of America David Sarnoff Research Center Princeton, New Jersey 08540
ADLER, Dr. Robert	Vice President and Director of Research Zenith Radio Corporation 6001 West Dickens Avenue Chicago, Illinois 60639

PETTIT, Dr. Joseph M.	Dean School of Engineering and Professor of Electrical Engineering School of Engineering Stanford University Stanford, California 94305
PICKERING, Dr. William H.	Director Jet Propulsion Laboratory 4800 Oak Grove Drive Pasadena, California 91103
NOBLE, Dr. Daniel E.	Vice Chairman of the Board Chief Technical Office Motorola Incorporated 5005 E. MacDowell Phoenix, Arizona
JORDAN, Dr. Edward C.	Professor of Electrical Engineering Head, Electrical Engineering Department University of Illinois Urbana, Illinois 61801
GOLDMARK, Dr. Peter Carl	President and Director of Research CBS Laboratories, a Division of Columbia Broadcasting Corporation, Inc. High Ridge Road Stamford, Connecticut 06905
McKAY, Dr. Kenneth G.	Vice President American Telephone and Telegraph Company 195 Broadway New York, New York 10007

SOLOMON, Dr. George Edward	Vice President and Director Systems Laboratories TRW Systems Building E1, Room 3066 Redondo Beach, California 90278

SUPPORT STAFF

Mrs. Zell D. ALFRED

Mrs. MaryAnn COLLISON

Miss Mary DURKIN

Mrs. Evelyn M. GROSS

Miss Nelle HALL

Miss Esther KLEIN

Mrs. Kathleen SHEARER

CHAPTER ONE

INTRODUCTION

Few technological changes have had so profound an effect on the human condition as the development of telecommunications. Man today lives in a maze of electronic signals; it is certain that their influence on the quality of his environment will be even more important in the future than is the case today.

The potentialities of telecommunications are both inspiring and frightening. Modern methods of communications can be instruments of enlightenment, or tools of tyranny. They can make the best and the worst in man instantly available to everyone: great plays, knowledge, and the conversation of philosophers; cruelty, distortion and propaganda as well. They enrich the fabric of society, and at the same time they strain it. An effective strategy for meeting the worldwide yearning for education -- and first of all, for literacy -- is inconceivable without the use of television and other electronic communication tools to supplement the efforts of teachers. But television can also propagate and perhaps multiply themes of chaos. A truly global communications system could help knit the family of nations into a living community, based on mutual understanding, and the universal diffusion of knowledge and skills. But if men will otherwise, it could also perpetuate mistrust, and deepen the divisions among nations and peoples.

Improved communications are essential to a growing world economy. They are vital to the progress of advanced and developing nations alike. New services promise to revolutionize customary patterns of business and finance, learning, entertainment and leisure, and the processing, storage and retrieval of information. Above all, they offer the citizen everywhere the opportunity to acquire the knowledge and the insight essential to the mature exercise of his responsibilities.

Within each nation, and among nations, the wise use of telecommunications is a key to success in building and reinforcing the sense of community which is the foundation of social peace: a sense of community based on freedom, and on tolerance of diversity; a community which encourages and appreciates the unpredictable richness of human imagination; but a community nonetheless, faithful to its own rules of civility and order.

In the United States, our faith is committed to the principle of freedom of speech. Telecommunications have afforded new dimensions, and presented new problems, in the exercise of freedom of speech, the most fundamental of all freedoms for a democracy. On the one hand, telecommunications provide a vehicle for vastly enlarging the reach and impact of individual expression. On the other, however, access to the medium is not unlimited. Recognizing this dilemma, national policy has carefully sought, at least since the passage of the Communications Act of 1934, to develop a legal and economic framework for communications policy which allows many voices to compete in the market place of ideas and of taste. We have taken pains to protect society against the risks of concentrated power, in the hands either of government or of the communication companies. In this connection, we note with high hope the passage of the Public Broadcasting Act of 1967, and welcome the contribution it should make to the quality and variety of the broadcasting available to our people.

We have not interpreted our mandate to require a study on our part of the content of communications, or of the challenges we face in establishing rules of the game for the exercise of the power and the privilege of mass communication. But an awareness of these problems is the context of our study.

We do believe that the social and psychological effects of mass communication define one of the most important of all fields of research, both for public and for private groups, in the years before us, and we recommend that they become an active focus for sustained effort. This is an area where we cannot afford to have public policy based on ignorance. What is at stake is too precious, and too fundamental, to be lost through neglect.

II

Our study then is addressed primarily to the legal and economic structure of our communications system, and to the policy considerations which in our view should guide its evolution, both at home and abroad. New technology is transforming the realm of communications. One of the most basic aspects of our mandate is to make recommendations for the integration of new and old communications facilities into a balanced communications system which could meet the needs of a dynamic and expanding world society.

Four axioms have guided our work.

First, we deem it to be an accepted goal of national policy that the United States remain a leader among the nations in communications science and technology, and in communications service. This target for policy is not a matter simply of pride. Communications technology is an increasingly fundamental aspect of national security. Telecommunications can play an equally fundamental role in achieving understanding and harmonizing conflict within and among modern societies dominated by diversity, mobility, and the claims of social justice. Telecommunications are an essential support for world commerce and finance. And communications equipment and know-how, like other products of advanced technology, should represent a rising share of our exports. For the foreseeable future, moreover, our communications technology will be a principal factor in efforts to develop and perfect a global system of communications through which knowledge and information could be made universally available.

Our present lead in communications technology is not a gift of nature, but the consequence of history and organization, and the stimulating impact of wartime and postwar government and private programs of research. Other industrial nations are making rapid progress. For many reasons, we cannot and should not tolerate the waste of missed opportunities.

Second, we take it as self-evident that telecommunications policy should seek to maintain and develop an environment always sensitive to consumer needs. It should be an environment hospitable to productive innovation in facilities, services and management. Advancing technology promises a host of new opportunities. Among them are: the realization of the full potential of satellite communication and teleprocessing; the production of terminal equipment offering small business users a far wider range of telecommunications services; and the expansion of the range and diversity of television. The challenge is to transform the fruits of technological knowledge into tangible benefits for the public, through cost-reducing innovation and well-conceived public policy.

Third, the realm of telecommunications should be viewed as a system, extending from public and private research, at one end of the spectrum, to the provision of private and common carrier communications services, at home and abroad, at the other. Our study has taught us the necessity to keep the whole of this system, and its interconnections, steadily in view. We have found that none of its problems can be examined in isolation, and therefore that piecemeal or segmented treatment of any one of them can be misleading.

Fourth, we have assumed that special consideration should be given to the needs of the developing nations. Modern telecommunications systems can be a valuable -- indeed, nearly indispensable -- catalyst of their economic, social and political progress.

III

The role of government is of unusual importance in telecommunications. How well government meets its responsibilities is and will continue to be a major factor in the development of the communications system as a whole.

One cannot carry on the telephone, telegraph or broadcasting business, either domestically or internationally, without government approval and regulation. Access to the radio frequency spectrum is necessarily managed by government. Government is a major consumer of telecommunications services and equipment, and supports extensive research and development. It is deeply involved in international cooperative ventures like the International Telecommunication Union and the International Telecommunication Satellite Consortium (INTELSAT). We also note that if widespread applications of telecommunications to the problems of disadvantaged minority groups at home and of poor nations abroad are set in motion, such programs will be realized only with the initiative or support of government.

Government cannot and should not take over the functions of private business. Indeed, in certain areas, we recommend that policy rely more on market forces, and less on regulation, than in the past. But the wisdom of government policy in telecommunications will have a great deal to do with the capacity of the private sector to realize its full potential.

The essential goal of national policy, in our view, is an optimal rate of improvement in our telecommunications capability, based on progress in science, technology and the arts of management and addressed to the growing needs of its users. To achieve this goal, policy should continue to rely largely on the spontaneous initiatives of private business and non-governmental research, supplemented where necessary by government-supported or sponsored research and development.

The main concern of policy in this field should be to improve the effectiveness of regulation where regulation is necessary, to remove unnecessary restraints on private initiative, and to provide as free a field as possible for the imagination and enterprise of innovators.

Among the most pervasive of our findings, therefore, is the need to strengthen governmental capabilities, both in the FCC and in the Executive Branch, to develop and implement policies which will enable the private sector to reach its full potential. This recommendation is discussed in Chapter Nine. In recent years, most markedly in the common carrier area, the FCC has confronted a host of policy problems engendered by the rapid advance of technology and services. More loom ahead. It currently lacks resources to deal adequately with the burdensome day-to-day business of administering the regulatory statutes and to develop long-run policies. It needs increased resources and the assistance of a strengthened Executive Branch organization embodying a variety of missions and personnel. Unencumbered by day-to-day regulatory chores, that organization should be charged with coordinating executive roles and should be capable of taking the long view of policy problems.

The most notable feature of the telecommunications system viewed in perspective is its extraordinary rate of technological change. In recent years, communications have gone through a revolution in technique, and others are in prospect. It follows that one of the most important qualities to be stressed in guiding the evolution of the system is adaptability to change. We should seek to establish policies and institutions which maintain and if possible increase its capacity to respond constructively to new opportunities, both by removing impediments, and by improving incentives.

Important as it is to answer the specific policy questions put to us in the President's Message of August 14, 1967, it is even more important to strengthen existing capacity and to create a new policy entity in the Executive Branch capable of answering comparable questions in the future as they arise. No ad hoc group like this Task Force can hope to clear the desk for long. In this field, we can be certain, problems of public policy will continue to develop, in view of the pace of change, and the government's deep and continuous involvement.

IV

The Report is organized around certain topics: the organization of our international telecommunications industry; policies to support and strengthen INTELSAT; telecommunications needs of less developed countries; uses of domestic satellites; structure and regulation of the domestic carrier industry; future opportunities for television; spectrum use and management; and Federal Government roles in telecommunications.

In this Introduction we do not undertake a separate summary of each chapter. Rather, we review the main policy recommendations of the separate chapters in a functional perspective which identifies six principal themes. Those themes, which shape many of our recommendations, are:

1. promoting experiment and technological advance;

2. determining the proper roles of monopoly and competition in the provision of telecommunications services;

3. enhancing the potentialities for progress through the removal of unneeded or obsolete restrictions on private initiative;

4. improving the capacity of government to meet its continuing responsibilities in telecommunications;

5. expanding study and research, both public and private, in the field of telecommunications policy and;

6. promoting international cooperation.

(1) Promoting experiment and technological advance. We stand at the threshold of an immensely promising era in applying new technology. To achieve the full potential benefits of the new technology, however, operational experiments will often be needed to explore the feasibility and flexibility of full-scale systems. In some instances

government support for such efforts will be necessary and desirable. Three specific areas for such experiment and innovation are recommended in the Report.

The first is the domestic application of communications satellite technology which is treated in Chapter Five.

Satellites already seem a promising transmission mode for domestic wideband communications services. There are still more attractive potentialities for the future. A number of proposals for action in this area are now before the FCC. But the issues are complex. Existing investment and prospective innovation in the domestic terrestrial telecommunications system constitute one dimension of the problem. Different institutional and functional approaches to the exploitation of satellites constitute another. Other factors, including spectrum considerations and the nature of our international commitments, caution against irrevocable decisions or closed minds about the future use of satellites in providing domestic telecommunications services.

We must contemplate the possibility that permanent approval of any fully operational system at this time might well fix the institutional and operational framework of domestic satellite communications services prematurely and foreclose valuable options for the future. Before we reach any final decision about the ownership and operational design of domestic satellites we think it is desirable to benefit from some exploratory operational experience.

In Chapter Five, we recommend a prompt start upon a pilot program designed to provide useful technical, operational and economic data as a basis for more permanent policy decisions. On the basis of its operational experience in the satellite field, ownership of the space segment and the overall management responsibility for the program should be entrusted to Comsat. But, to the extent consistent with the economic and operational viability of the venture, common carriers, broadcasters, and other users should be eligible to participate in ownership of ground stations. */ However, they, and Comsat alike, should be authorized to participate in the pilot program as interim owners without any assurance of more permanent rights upon the expiration of the project.

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*/ Dr. Welsh (NASC) believes it is more efficient based on our previous experience to have Comsat be the sole owner of such facilities. See footnote, Chapter Five, page 28.

Direct access to the satellite by various classes of users should be assured; such flexibility will increase the yield of vital information and afford an opportunity to explore design and operational alternatives for subsequent full-scale systems.

Second, as recommended in Chapter Four, our studies indicate that improved telecommunications generally promise important contributions to the less developed world. Educational television and satellite communications are particular examples. Administrative and other problems involved in introducing modern technology into the fabric of a less developed country are considerable, and their cost and difficulty are generally underrated. Careful preliminary testing and training will be required before we can reach firm conclusions about the possible contribution of full-scale applications of telecommunications technology to major development problems in some of the less developed countries. Thus, we propose the exploration of realistic programs of regional and international cooperation in this area, with international support, where appropriate, for such efforts. The immediate need, again, is for feasibility studies and modest pilot projects.

Finally, in Chapter Seven, we recommend serious exploration of experimental domestic programs designed to test the utility of television in support of activities to assist disadvantaged groups within our population. Our studies suggest constructive possibilities for the use of television to help overcome some of the problems of urban ghetto dwellers. Isolated rural people such as the inhabitants of Indian reservations could benefit from similar undertakings. But government or foundation support and leadership would almost surely be needed to launch pilot programs of this type.

(2) Determining the proper roles of monopoly and competition in the provision of telecommunications services. The premise of our law with respect to industrial organization is that competition should be the rule, and monopoly the exception. Monopoly must be resorted to where a single seller is desirable as a consequence of conditions that permit him to offer most economically the full supply required by the market. Under such circumstances the monopolist is usually regulated by public authority to protect the public interest.

In the field of domestic telecommunications our public message telephone service is such an example. We find in Chapter Six that, under existing technology, the integrated provision of that service by common carriers is satisfactory and should be preserved. This conclusion is based on considerations of system optimization, system integrity, and service reliability. It is based as well on considerations of national security policy. But an integrated public message telephone service is not a static configuration. The telephone network is constantly evolving, for it exists in an environment being continuously transformed by change: technological developments; new services, and the demand for even newer ones; and changes, too, in the ideas governing public regulation.

The goal of public policy in this area should be an environment for the provision of services which will assure the maximum freedom of opportunity for such developments while preserving the integrity and economic viability of the basic integrated network.

Obviously parts of the communications industry viewed as a system do not and cannot significantly affect the basic telephone network. Their potential can and should be used in the improvement of that network, and allowed to provide services which supplement those of the telephone network.

In the international field, cable and high frequency radio facilities are maintained by the U. S. international voice and record carriers, and satellite services are provided by Comsat through INTELSAT. The present industry structure largely divides international communications by type of traffic and mode of transmission. But the old distinction between voice and record services has lost its technical significance; both voice and record transmission are now carried largely by identical facilities. And the growing capacity and resultant economies of scale of new modes of transmission challenge the structure of the industry.

Two technological factors underlie the structural problems of the international industry: the rapid deployment of communication satellites, and the development of transistorized undersea cables -- each with vastly greater and continually growing capacity than earlier modes of transmission and at lower cost per circuit. It is estimated, for example, that in the early 1970's a single satellite will have sufficient capacity to handle all Atlantic basin requirements for communications traffic originating in or destined for the U.S.

This fact threatens the possibility of rational economic decision making for future investments in this sector of the industry, under its present structure of divided ownership. No single firm is now in a position to decide between alternative techniques for meeting requirements on operational and economic grounds. And, under present regulation, traffic may well be divided, and investment decisions made, on the basis of compromises deemed fair and equitable to industry claimants, rather than on the basis of minimum social cost.

On balance, cable-satellite rivalry under the conditions prevailing today does not promise that social benefits will be sufficient to outweigh the cost of uneconomic investment decisions. Nor does it appear likely that conditions of more effective competition can be established by modifications of existing rules and practices.

For this, and other reasons, we favor a single international transmission entity, and recommend a consolidation of transmission and switching facilities designed to bring about such an entity, subject to certain safeguards and conditions. */

However the industry structure may evolve, a strengthened regulatory capability is needed to deal with major investment decisions in the future. And in the absence of a restructuring such as we propose, we conclude that a reconsideration of certain past regulatory rulings would be desirable. In this context, we would favor elimination of carrier participation in Comsat.

(3) The removal of unnecessary restrictions on private initiative. Some areas of the telecommunications system do not or need not affect the integrity of the switched public message telephone network. Here the goal of policy should be the removal of unnecessary restraints to promote innovation and to encourage greater responsiveness to consumer needs.

One such area, discussed in Chapter Six, includes services which supplement those of the basic public message telephone network. In recent years, we have seen a growing

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*/ Dr. Welsh (NASC) does not concur with this recommendation. See footnote, Chapter Two, page 20.

demand for private line communication services by government and business users, both large and small. Subject to regulations designed to protect the integrity, reliability and viability of the integrated system, we recommend that greater opportunities should be opened for suppliers of supplementary services, both for-hire and not for-hire, to enter the market. More flexible opportunities for entry should be matched, moreover, by pricing policies which allow the established carriers to compete fairly with the new suppliers. Under such conditions, rivals would be on an equitable footing, cost reductions could be expected in certain areas, and the communications system could be fortified by the development of new equipment and new services of value to many parts of the economy.

Teleprocessing, as the combination of computer and communication services is known, represents another kind of supplemental service which has become increasingly popular. In this field, the removal of tariff restrictions on the sharing of communications lines, on splitting or resale of channels, and on message switching, seems compatible with maintaining the integrity of the basic communications network.

And in light of our finding that the field of teleprocessing currently lacks natural monopoly features, we believe that computer service companies should be permitted to compete generally on an unregulated basis, offering computer services including message switching and line sharing as well as data processing.

A third area where relaxation of some restrictions may be desirable is in broadcasting. Recent years have witnessed the growth of cable as a mode of television distribution to the home. Cable television has high promise as a technology for improving and diversifying television services. In our view, its development should be governed by regulatory policies which allow freedom for fair competitive market forces, while safeguarding the public interest in over-the-air broadcasting. In Chapter Seven, we recommend an approach to such regulatory policies, which could permit a flexible accommodation between the development of cable services and the existing broadcasting industry.

Finally, in Chapter Eight, we conclude that policies and institutional arrangements relating to the electromagnetic spectrum require modification, to assure fuller and more economic use of this invaluable and scarce resource.

The privilege to use spectrum is obtainable only from the Federal Government. The thrust of our findings is that greater flexibility is needed in spectrum management. The present system of established administrative priorities is excessively rigid, and retards flexible adjustment to variations in needs and benefits. This is further aggravated by a single nationwide division of resources and management authority between Federal Government and non-government spectrum uses. Additional inflexibility results -- particularly in non-government spectrum use -- from the practice of allocating blocks of spectrum to specific user groups on a nationwide basis.

We have not discovered any simple solution to these problems. Our studies have encompassed the most frequently proposed alternatives to the existing pattern of administrative allocation: creating freely transferable property rights in spectrum, or creating an even more complex allocation system through the extensive use of the techniques of spectrum engineering. We are persuaded that the most promising solution at this stage involves an eclectic approach. That solution would preserve the essential character of the present system while introducing important -- if incremental -- modifications of existing administrative, economic and engineering practices.

Among our principal recommendations, we urge the consolidation of the spectrum management function in a single Executive agency. We think it can more effectively achieve optimum utilization of this unique and valuable resource. Further, we urge the relaxation of the block allocation system and, in some areas, a movement away from administrative allocation toward market methods which could help shift some lower-valued uses of spectrum to higher-valued uses. We also recommend greater use of modern engineering techniques in the assignment of spectrum and coordination of spectrum uses.

(4) Improving the effectiveness of government's role. A strengthened telecommunications capability in the Federal Government is important to many of our recommendations. In this connection, we recommend changes in the Communications Act of 1934, to bring the statute up to date, and to give the FCC adequate authority and opportunity to review the major

investments which constitute the rate base of regulated entities. We also recommend that regulatory capabilities be adequate to provide incentives for cost reduction, and to determine the interplay of competitive and monopoly factors in the industry.

Our studies show that neither the FCC nor the Director of Telecommunications Management (DTM) has the resources required to discharge their present regulatory and Executive Branch responsibilities satisfactorily. Our recommendations for improved regulation would increase the burden on the FCC. Therefore, greater staff capability is essential.

Pursuant to the President's instructions, the Bureau of the Budget will report separately on its review of the administrative and managerial aspects of government organization in this field. In our report, we recommend that the Executive Branch should have a strengthened capability to address the broad range of policy questions of concern to the Executive. It should have adequate technical and financial resources to make appropriate long range studies; to give useful advice on specific issues to the FCC, to

State governments, to various Executive Branch agencies, and to private groups and industries; to explore new applications of telecommunications; and above all to coordinate Executive roles in telecommunications leading to development of coherent and forward looking policies guiding Executive action. It should also have the responsibility for unified spectrum management proposed in Chapter Eight.

Among its other roles, the Executive should have the capability to determine (with the Department of Labor) the nature and extent of any employment effects which might result from the organization and technological changes flowing from this report, and develop appropriate employment and adjustment assistance measures to meet any potential problems. */

These tasks should supplement and reinforce, not duplicate the work of the FCC, and the strengthening of Executive capability should not detract from or delay the augmentation we recommend for the FCC.

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*/ Beyond this, the government should develop measures for protection against possible adverse effects due to technological change.

(5) More research and study. In our study we were repeatedly struck by the paucity of data relating to the economic characteristics and performance of the telecommunications industry. The field of telecommunications has thus far not generated anything like the amount of serious policy research that its importance justifies. Effective policy making, both by business and by government, could profit from the sustained study and critical analysis of well-informed scholarship. We therefore urge governmental, foundation, and business support for increased inter-disciplinary research and training in telecommunications policy.

To ensure that the government is exposed to a steady flow of independent, critical and creative ideas, we believe that an institute and preferably more than one institute, for communication policy training and research should be developed outside the government. Such institutes should undertake the advanced interdisciplinary training of communications experts -- economists, lawyers, engineers, management experts, social scientists and others -- to deal with problems of communications policy which transcend the confines of any single discipline.

(6) International cooperation. INTELSAT -- the global communications satellite consortium in which 63 nations, including the United States, are now represented -- has led to a wholly new pattern of cooperation in the communications field. It provides a striking demonstration of successful international cooperation in a complex undertaking -- planning and operating a global satellite communications system. We should continue to support the goal of developing and perfecting the global system, taking into account developments since 1964 as well as those now in prospect.

Definitive arrangements for INTELSAT are to be negotiated in 1969. We suggest in Chapter Three that these arrangements should be sufficiently flexible to adapt to the changing needs of INTELSAT members, and to accommodate specialized satellite facilities, without weakening the foundations of the global system. INTELSAT's institutional structure and decision-making process should be modified where necessary to reflect changed circumstances since its creation. In Chapter Four, we emphasize the importance of international cooperative arrangements for satellite applications in less developed countries. INTELSAT should play a key role in those cooperative ventures.

V. CONCLUSION

In his Message of August 14, 1967, President Johnson said:

> "This message does not create a new communications policy for our nation. Rather it proposes the foundation for that policy.
>
> -- It reaffirms our intentions as a partner in INTELSAT.
>
> -- It considers the need for modifications in our international communications posture.
>
> -- It sets in motion the necessary studies for a better understanding of policy needs in domestic and international communications."

The issues of policy we have isolated for examination in response to the President's charge are those we deem now to be most relevant. Many of our conclusions are necessarily tentative. They define what we regard as the directions that policy ought to follow, rather than definitive solutions for complex and closely balanced controversies now before our government. We conceive this Report as a compass for policy, not a blueprint.

ORGANIZATION OF THE UNITED STATES INTERNATIONAL COMMUNICATIONS INDUSTRY

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CHAPTER TWO

ORGANIZATION OF THE UNITED STATES INTERNATIONAL COMMUNICATIONS INDUSTRY

INTRODUCTION

The impact of satellites on communications was a central theme of President Johnson's Message to Congress of August 14, 1967. The development of satellite communications by INTELSAT since 1964, and the promising future of satellites are transforming the environment for international communications. The posture of our nation's international communications industry was another central theme. The President noted that unlike most other nations, the U.S. has no "chosen instrument" to handle its international communications, and that while our "normal instinct is to favor the existence of multiple companies in each commercial field ... there is a legitimate question as to whether the present division of ownership in our international communications industry continues to be in the public interest."

The nation needs efficient, low cost, reliable communications with other countries. This is important not only to private individuals and businessmen, but to the government as well, since it is by far the largest single user of international commercial communications.

International communications are vital to our national security, and serve as an important vehicle for furthering the foreign policy objectives of the United States, including promotion of international cooperation and cordial relations with other countries.

For the less developed nations, cheaper, more reliable and more direct methods of communication are indispensable. Progress in all fields of endeavor -- both in the advanced and less developed countries -- requires modern communications to facilitate the rapid diffusion of information and ideas and to promote international trade and commerce -- a catalyst for worldwide progress.

The structure of our international communications industry has been debated intensively for many years. Congress has given the FCC authority to confer antitrust immunity to a merger of the domestic telephone and telegraph carriers, but such authority presently does not extend to restructuring the international communications industry. In 1966, the Intragovernmental Committee on

International Telecommunications, composed of officials of the Departments of State, Justice and Defense, the Chairman of the FCC, and the Director of Telecommunications Management, submitted a report to the Senate and House Commerce Committees recommending legislation to amend the Communications Act of 1934 to permit the FCC under its proceedings to authorize restructuring of the industry under certain conditions if the FCC decided that such a step would be in the public interest.

This Task Force believes that a basic reorganization of the industry to form a single international transmission entity is desirable, subject to certain safeguards and conditions, in order to assure the achievement of our nation's goals in international communications.*/

I. THE PRESENT ORGANIZATION OF THE U.S. INTERNATIONAL COMMUNICATIONS INDUSTRY IS THE PRODUCT OF LONG TECHNOLOGICAL EVOLUTION AND NUMEROUS GOVERNMENT DECISIONS

Telegraph cables and high frequency radio were the principal modes of U.S. international communication until the introduction of voice-grade submarine cables in the 1950's, which provided transoceanic telephone service of much better quality than previously, and also provided facilities for telegraph circuits at much lower cost than through telegraph cables.

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*/ See footnote, page 20.

The early 1960's saw the development of satellite communications. The existing common carriers urged that communications satellites, like voice-grade submarine cables, be entrusted to them. Others, citing the immense governmental investment in space technology, called for public ownership. In the Communications Satellite Act of 1962, Congress followed a middle course. It provided for the creation of a new entity, Comsat, to exploit communication satellite technology and serve as the U.S. participant in a global satellite system. Under the Act, Comsat is subject to more extensive government regulation and supervision than the other common carriers, who are subject to FCC regulation only under the 1934 Communications Act. Furthermore, the 1962 Act reserved 50% of the corporation's common stock to authorized common carriers, who elect six of the 15 members of Comsat's board of directors; _*/ the non-carrier, or public stockholders also elect six directors; and three are appointed by the President, by and with the advice and consent of the Senate.

_*/ As of Nov. 1, 1968, the carriers held only about 42% of the outstanding common stock of the corporation, and legislation has been proposed to revise the formula specified in the Act for carrier representation on its board of directors.

The global satellite system envisioned by Congress in 1962 began to take shape in 1964, when the INTELSAT Interim Arrangements created an international joint venture of operating communications entities to own and operate the space segment -- the satellites and related facilities -- of the global system. Comsat participates in INTELSAT on behalf of the United States. INTELSAT now has four satellites in operation providing about 960 circuits in the Atlantic and Pacific Ocean basins, and plans service in the Indian Ocean in the near future. The two Atlantic basin satellites have a capacity about equal to the presently operating transatlantic voice-grade cables. Extensive further development of the global satellite system is planned.

Our international communications are now handled in several ways. Message telephone traffic travels over the domestic telephone network to cable heads, satellite earth stations, or high frequency radio stations. This traffic is then carried to distant points on voice-grade submarine cables (mainly by AT&T), on INTELSAT satellite circuits, or -- to a decreasing extent -- by high frequency radio.

Record and mixed voice-record (alternate voice/data or AVD) traffic is carried by domestic telephone or

Western Union lines to the office of the international record carriers in gateway cities (principally New York, and San Francisco), thence to cableheads, earth stations, and radio stations for long haul transmission as before. The principal record carriers are ITT World Communications (a subsidiary of ITT), RCA Global Communications (a subsidiary of RCA), and Western Union International (separated from the domestic Western Union Company in 1963).

The international voice and record carriers (together with their foreign counterparts) own the voice-grade cables used in international service. They obtain INTELSAT satellite circuits by lease through Comsat and share ownership of the U.S. earth stations with Comsat. The voice and record carriers each own high-frequency radio facilities.

Comsat is already showing an operating profit; the record carriers are operating in the black; and the entire industry is growing rapidly. But this current growth should not hide the fact that the advent of commercial satellite communications, the changing environment of international operations, and recent regulatory decisions have had a serious impact on the industry.

II. A FUNDAMENTAL RE-EXAMINATION OF THE INDUSTRY IS NEEDED

A. A Fragmented Ownership Structure Poses a Principal Problem

Present U.S. industry structure largely divides international communications by type of traffic and mode of transmission. But the old distinction between voice and record services has lost its technical significance; both voice and record transmission are now largely carried by identical means. And the growing capacity and resultant economies of scale of new modes of transmission set a major challenge to our compartmentalized industry structure.

In its simplest form, the policy question posed, to paraphrase Judge Learned Hand's famous phrase, is whether technology has now thrust monopoly upon the international communications industry. More specifically, we must examine in the context of the present and prospective technology and organization, whether rational economic investment choices are most likely to be made among alternative modes of international transmission, now or in the future, without reorganizing the industry to form a single operating entity for international transmission.

Two technological factors underscore the structural problems of the international industry: the rapid deployment of communications satellites, and the development of transistorized undersea cables -- each with vastly greater and continually growing capacity than earlier modes of transmission and at lower cost per circuit. It is estimated that in the early 1970's a single satellite will have the capacity to handle all Atlantic basin requirements for traffic originating in or destined for the United States -- and these requirements are substantially greater than in any other region in the world. Economies of scale in submarine-cable technology are also rising rapidly. The largest transatlantic cable operating today has a capacity of only 138 circuits. TAT-5, which the FCC has recently authorized, will have 720 circuits, and it is expected that by the middle 1970's cables with a 2500-circuit capacity will be available -- and at much lower cost per circuit than today's undersea cables.

In the present environment, investment decisions involve considerations which will make it difficult to achieve that combination of satellite and cable facilities which best serves the nation's needs and particularly, avoids overbuilding. A major concern of telecommunications policy should be to protect users from having to bear the burden of unwarranted investments in communications facilities.

Recent industry and government decisions illustrate the nature of the issue. In 1966, the FCC approved separate applications to build an earth station in Puerto Rico and a transistorized 720-voice circuit cable from Florida to the Virgin Islands. Although the cable was defended on grounds it would provide interim capacity for service between North and South America and the Caribbean area, even if the highest responsible estimate of demand for 1970 should materialize, either the cable or earth station will turn out to have been a redundant facility. Yet cable and satellite interests supported the parallel developments. In granting both applications, the Commission stipulated that new traffic was to be allocated 50/50 between satellite and cable circuits. The social costs of policies designed to maintain a rough parity between cable and satellite communications are not trivial. TAT-5, a new transatlantic cable recently authorized by the FCC with the concurrence of the State Department, will involve an initial investment of $70 million and require revenues of some $250 million over its useful life. Should satellite capacity alone be adequate in the near future to accommodate all transatlantic traffic at comparable or lower costs -- a prospect which appears quite likely, given INTELSAT IV development and projections of traffic demand -- these cable revenue requirements may be quite burdensome to users.

The goal of policy in international communications should be a system which permits such investment choices to be made on sound economic grounds, once the claims of defense and other national interest and foreign policy requirements are met. An efficient international communications system will increasingly require a careful meshing over time of the various methods of transmission -- submarine cables, high-frequency radio, satellites and their attendant earth stations, and doubtless other future techniques as well. Each method has advantages and disadvantages; different patterns of costs and benefits;

different capacities, service characteristics, vulnerabilities to accidental or hostile disruption, useful lifetimes, and building times. To achieve the best blend of facilities in international transmission will involve complex investment decisions among alternative transmission technologies for meeting new demands. Today, no single firm is in a good position to make such overall decisions. The FCC normally acts as a reviewer, not an initiator, of investment decisions, and in any event, it is very difficult to make comprehensive long-range and systematic judgments regarding alternative technologies based on sporadic filings by interested parties. Nor has the Executive Branch performed this latter function.

The voice and record carriers now have a number of reasons for preferring investment in new cables to the leasing of additional satellite circuits from Comsat. Some may not be congruent with overall system optimization. These reasons include considerations of law with respect to their rate-base; the business policy of providing customers a complete communications service entirely under their control; reluctance to become dependent on Comsat, a potential competitor; actual or imputed differences between self costs (for cables) and lease costs (for satellites); greater confidence in their own ability to establish and maintain facilities; and, on the part of the record carriers, concern over being relegated to a minor role in the industry. These considerations reflect the fact that, when Comsat was given a monopoly position in the global system, the carriers were thereby precluded from direct participation in satellite ownership for international communications. They do, however, under interim FCC policy, share ownership of satellite earth stations. Comsat is in the converse position of having an exclusive commitment to satellites, and thus a natural interest in pressing the development of this mode of transmission. It has no interest in cables and is not authorized by law to make cable investments.

Some doubt has been expressed whether this problem is serious. Conceivably, the practices of AT&T and the record carriers up to now may have reflected the fact that satellite circuits were not significantly cheaper because of satellite pricing policy. Were decisive cost advantages soon to appear in satellites, as many anticipate, the preference of carriers in favor of cable technology might prove to be merely transitional. Arguably, moreover, such preference might be countered by appropriate regulatory action. The present structure has been said to have some advantages since it pressures carriers to expose for government decision competing choices and considerations, and to pass to the public economies in the form of lower rates and diversity of service. Giving due weight to such considerations, we are nevertheless persuaded that the central problems in the industry cannot be adequately dealt with in the absence of a fundamental restructuring of the industry.

No firm is now well situated to decide between alternative techniques of meeting a particular requirement on operational and economic grounds. And, under present regulation, traffic may well be divided arbitrarily, and decisions made, on the basis of compromises deemed fair and equitable to industry claimants, rather than on the basis of least social cost. On balance cable-satellite rivalry under prevailing conditions does not promise sufficient social benefits to outweigh the dangers of uneconomic investment decisions. */

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*/ See footnote, page 20

B. Other Pressing Problems Concern the Future Roles of Comsat and the Record Carriers, and Government Regulation and National Policy

1. The future of Comsat. Controversy over the role and future of Comsat has not abated since its creation in 1962. Instead of finding a fully-accepted place in the industry, Comsat has found itself locked in controversy with the established voice and record carriers on a number of occasions. Some of these differences have resulted in FCC decisions that have had a major impact on the corporation.

In its "authorized-user" decisions the FCC ruled that Comsat was a "carrier's carrier" precluded from serving users directly except in unique or exceptional circumstances. Under these rulings, which raised serious questions concerning the interpretation of the 1962 Communications Satellite Act, Comsat was forbidden to serve the government directly except when required by the national interest. In its "earth station" decision last year, the FCC reconsidered an earlier ruling and authorized the international carriers to own a 50% share of each U.S. earth station built or then planned, with Comsat owning the other 50% and acting as manager. To finance its share of the global system, Comsat raised some $200 million by an initial issuance of stock. Today more than two-thirds of Comsat's original capital remains in cash or securities rather than in productive communications assets.

Comsat's interlocking directorate with the carriers has been a source of continued controversy. Experience has shown that in many areas, Comsat has interests conflicting with those of the terrestrial carriers. Despite the authorized-user decisions, which insulate them from direct competition, the terrestrial carriers and Comsat are rivals in a very real sense.

Finally, Comsat's domestic role is uncertain. Comsat has a monopoly position as the U.S. entity in the global satellite system, and concern has been expressed about permitting it also to enter the domestic satellite field -- particularly if it should be given a monopoly of all commercial satellite communications, domestic and international.*/

The role of the government in Comsat's creation and the corporation's significant role in international communications make these problems of public concern.

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*/ See footnote page 20.

2. The future of the record carriers. The international record carriers offer three basic kinds of services: telegram (equivalent to domestic Western Union public message service); teletypewriter (equivalent to domestic TWX and Telex), and switched narrowband and broadband data (computer-to-computer); and leased line services, either pure record or mixed voice record (AVD). They also often provide their customers with terminal equipment. Persistent controversy has surrounded the status of the international record carriers.

In the U.S., these carriers are largely dependent upon the facilities of the domestic telephone and telegraph carriers. Thus, in the case of public message service (outside certain gateway cities), an individual desiring to send a telegram overseas contacts the local Western Union office which transmits the message over its lines to an international record carrier switching center in the appropriate gateway city for transmission overseas. If the individual does not specify a particular international record carrier to handle his message, Western Union will transfer it to a carrier in accordance with current quotas under a formula established by the Communications Act of 1934. In the case of the teletypewriter exchange and switched data services non-gateway city customers are with few exceptions subscribers to Western Union's Telex or AT&T's TWX service who also use their instruments for international service. Automatic Telex service (customer dialing) is possible with an increasing number of overseas points. For leased services which are not switched, the international record carriers have no real switching or interfacing functions, although the transmission is run through a loop from a domestic carrier's lines to a record carrier's office where it is monitored and tested. In most instances, a record carrier derives as many usable communications channels as possible from the transmission capacity available through the undersea cable or satellite and also supplies the equipment to maintain signal quality. The record carrier also furnishes terminal equipment used by leased line customers.

AT&T's offer of alternate voice-record service (AVD), and to some extent, the availability of high-quality telephone service in AT&T's submarine cables, made deep inroads into the record carrier's business and profits. But an FCC decision in 1964 provided a regulatory framework in which they could expect to maintain profitable operations. The Commission ruled that they were entitled to a share of the ownership in the fourth (TAT-4) and later transatlantic cables, and that they would have an exclusive right to offer any additional AVD service (AT&T was permitted to retain only AVD service already provided by it). This decision has, in the view of some, created an artificial support for the record carrier industry, not warranted on economic grounds. On the other hand, others feel that this decision was fundamental to the maintenance of the record carriers as viable entities, providing basic international message telegraph services without major rate increases over the past decade.

In the "30 circuits case" Comsat proposed rates for Pacific satellite service far below those of the record carriers. Had Comsat been permitted to deal directly with ultimate users (in this case the Defense Department), thus by-passing the other carriers, the international record carriers would have been put in a much weaker economic position. While international record carrier rates for leased circuits were reduced because of the "30 circuits" case and subsequently thereto, it is clear that the FCC's authorized-user rulings have insulated the record carriers from direct competition by Comsat. The future implications of these rulings remain unsettled.

Some question the magnitude of the record carriers' role in the international communications process. Our research indicates that there has been some service competition among the record carriers. Areas of competition include proper maintenance of facilities, quality of proposals outlining new services for customers, terminal equipment alternatives, and dealings with foreign correspondents as a representative of the customer for the establishment of communications services. In addition, there is at least some rate competition among the record carriers. These competitive benefits must be weighed against the detriments of a fragmented industry structure. These would include some duplication of facilities and manpower adding extra costs, and the inability of large users to deal directly for transmission capacity as a result of the authorized-user rulings.

3. Government regulation and national policy. Doubts have been expressed about the FCC's rulings in resolving the frequent disputes that have marked the history of the international industry. In addition, it is alleged that the ability of the Executive Branch to secure adequate international communications for military and other governmental services, and to advance U.S. foreign policy

objectives, has been impaired by the plurality of firms in the industry. It is argued that the divided organization of U.S. international telecommunications services does not enhance the contribution that these activities can make to the foreign policy objectives of the U.S., and that a single U.S. entity presenting a consolidated U.S. position on transmission matters would be in a strong negotiating position to deal with foreign entities.

III. OF THE VARIOUS ALTERNATIVES THAT HAVE BEEN SUGGESTED, FORMATION OF A SINGLE ENTITY FOR UNITED STATES INTERNATIONAL TRANSMISSION SEEMS THE MOST EFFECTIVE ORGANIZING PRINCIPLE OF THE INDUSTRY FOR THE FUTURE

This study has reached conclusions that the industry problems noted above are serious, and that a new single entity should be created for the basic international transmission functions now performed by Comsat and the international voice and record carriers.*/ First, let us examine other alternatives for dealing with the industry's problems.

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*/ Dr. Welsh does not concur in this view. He believes that some competition between technologies will benefit consumers. While he does not believe a merger action would cure the problems in the industry, if there should be such action, he favors a consolidation of international cables into one company and ownership and management of satellite communications, both domestic and international, in the Comsat Corporation. Such a result, in his view, would lessen the chances of conflict of interest on the part of the Comsat Corporation as manager of INTELSAT, should result in healthy competition and make it easier for an efficient regulatory agency to get the facts and keep down rates, and would reflect clearly the fact that satellite communications do not stop at the water's edge as does cable transmission.

A. Establishing Conditions of Effective Competition Between Cable and Satellite Entities Would Be Very Difficult

Direct and open competition between cable and satellite entities might theoretically produce optimal development of rival technologies, but establishing such an environment in practice in a regulated industry of so few firms would be very difficult, if not highly unlikely. Indeed, even if the authorized-user rulings should be overturned, effective competition might not be forthcoming. It is highly improbable that the balanced transmission plant needed to achieve national security and foreign policy objectives would result from direct and open competition between competing technologies premised mainly on cost considerations.

A single satellite will soon have the capacity to handle all traffic on several international routes (perhaps even whole ocean basins), probably at lower cost than alternative techniques. The pendulum might at some future date swing the other way, and an advanced cable or other technique achieve a decisive cost advantage. Competition in such circumstances would be so unstable that the regulatory authority, in our opinion, would naturally be disposed to shield regulated firms from its consequences, thus postponing the displacement of old technology by new.

Aware of the uncertainties of open competition and fearful of the mutually destructive force it would have, firms in the industry are likely to renounce such competition, preferring instead a policy of "live and let live." Rather than the life and death choices that the market makes in truly competitive situations, the pattern would likely be one of parallel development of the separate technologies, to some degree independent of economic justification.

In the view of some observers, the rivalry of the cable companies and Comsat has produced more rapid innovation and rate reduction than might otherwise have obtained. It is probably true, for example, that Comsat's low bid in the "30 circuits" case stimulated the record carriers to reduce their rates. However, the effectiveness of even this competitive spur has now been somewhat blunted by the FCC's authorized user rulings. Whatever the benefits of separate ownership, they will probably be more than offset by the increased costs imposed on the system, and borne ultimately by the users, if both technologies are permitted to develop on some basis of accommodation rather than strictly on need and cost.

If the protection against satellite competition afforded by the authorized-user rulings were removed, it would expose the record carriers to jeopardy. Comsat might surpass the record carriers in open competition. However, it would be difficult to imagine effective competition between Comsat and AT&T while AT&T controlled the routing of most originating traffic, unless compulsory interconnection were required. And, in any event, a question of equity would be presented: On what ground should public policy continue to prevent the carriers from using satellite technology to compete with Comsat?

Moreover, cable-satellite competition could not fairly be premised on cost considerations alone. Other factors, such as improved reliability through diversity of transmission modes and foreign policy objectives, are also entitled to weight in ultimate decisions about our international transmission plant. Such factors would strengthen the prevailing tendency to find an agreed compromise and would complicate the task of fostering genuine competition between cables and satellites.

Some argue that maintaining a distinction between satellite and cable entities has particular value because of the unique characteristics of the satellite mode. They point to the implications in the domestic satellite field and for our INTELSAT policies of a fusion of cable and satellite ownership. We deal with these aspects of the question elsewhere in this chapter. They do not alter our conclusion that establishing conditions of effective competition between cable and satellite entities would be very difficult.

B. Economies of Scale Preclude Competing Bimodal Entities

Another organizing principle of the international communications industry might be to create effective competitive entities that are not limited to a particular technology. One way to establish such a competitive environment would be to permit the carriers to build and operate satellites and earth stations if they desired -- or to participate in INTELSAT ownership -- and Comsat to lay cables if it desired. The authorized-user doctrine would be repealed, permitting direct competition among the various communications companies. Additional steps required under this approach would include divestiture of the carriers' interests in Comsat, so that they could not influence its policies, and perhaps separation of AT&T's international and domestic operations lest it use its control of most originating traffic to channel the lion's share of the international market to its own facilities.

This hypothetical solution would raise a number of difficult questions. One very serious problem would be its adverse impact on INTELSAT. Allowing separate U.S. entities to compete with one another by satellite for international traffic would be difficult if not impossible to reconcile with our commitment to the INTELSAT concept of a global satellite system. We also doubt the practicality of competing bimodal entities, because the capacity of existing and projected transmission facilities will be large in relation to demand. In the face of such a relationship between capacity and demand, it is unrealistic to expect effective competition in international transmission -- whether between satellite and cable companies, or between bimodal entities. In short, experience and analysis since 1962 strongly point to the evolution of a truly "natural monopoly." A natural monopoly is rarely encountered in the real world, but the transmission segment of international communications appears to be an area where the necessary conditions will be fulfilled.

C. Even Substantial Changes in Today's Regulatory Framework Would Provide Only Limited Benefits Under the Existing Ownership Structure in the Industry

The existing structure of the industry differs from the two models discussed above. Although the international voice and record carriers may not invest directly in the space segment of the global satellite system, they can and do use INTELSAT facilities obtained by lease through Comsat (and share high-capacity cable facilities). This structure nonetheless raises problems about the prospects for reaching optimal investment decisions for new transmission facilities in the future. Particular attention has been focused on the preference for cables shown by AT&T and the record carriers. Conceivably, steps short of industry restructuring could go far to cope with the problems arising under the present structure. For example, the rates of AT&T and the record carriers could be set on the basis of the most efficient and lowest cost transmission medium regardless of ownership; government review could be strengthened to enable rigorous scrutiny and evaluation of adversary proposals for new facilities and choices which avoid overbuilding; and the international carriers could be subjected more rigorously to the test of the market by giving others direct access to international circuits by modifying the authorized-user rulings.

Apart from questions concerning the practicality of such steps, experience under the present structure demonstrates the limited benefits resulting from the diversity of ownership in international transmission facilities. As noted, the carriers increasingly use joint transmission facilities. The benefits of competition are largely, therefore, in rates, terminal equipment and in arrangements for special communications services, not in transmission facilities. And even with consolidated transmission facilities such competition in rates, service and terminal arrangements can be maintained and fostered by providing users, carriers, and prospectively, perhaps specialized service companies, with flexible access to the international transmission facilities.

D. A Single Entity for International Transmission Would Help Rationalize the Industry

1. It would promote system optimization and enable realization of the available economies of scale. The reorganization we recommend involves consolidating the transmission plant of the international voice and record carriers, Comsat's satellite investments, the U.S. earth stations now operating or planned for operation in international service, and such switching

and other equipment as may be justified to realize economies of scale. */

A single entity for transmission would not have a vested interest in or natural preference for any particular technology or class of service. It would, therefore, be in a better position than any of the existing firms to make impartial system choices, and to exploit fully the available economies of scale as well as of specialization.

System optimization should be more susceptible to effective government review under the single entity approach. The regulatory body could examine investment plans in a comprehensive and consistent manner, free from claims by participants dependent to some degree on the furtherance of a particular technology. The regulator could insist on an explanation of the full range of possibilities open to the single entity. It would no longer be under pressure on equity grounds to authorize a facility the need for which was not clear, nor to program the introduction of new facilities on the basis of an accommodation -- by approving 50/50 sharing arrangements between entities tied to different transmission modes.

The danger would remain that a single entity might be slow to grasp opportunities for efficient and economical operation. However, if appropriate conditions are attached

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*/ In connection with such a restructuring, the international record carriers may choose to dispose of all their assets and franchises as discussed below.

to the creation of a single entity -- an issue to which we return -- this danger can be minimized. At this point, it is sufficient to note some of the factors that should motivate the single transmission entity to good performance: expanding and price-elastic demand for international communications; influence on rates and service which AT&T and other domestic users could be expected to exert as buyers of service from the new entity; and pressures for rapid application of advanced technology that equipment sellers should exert -- if the equipment market is kept open and competitive.

2. It would further U. S. foreign policy objectives. It is alleged that the plurality of U.S. international communications entities has been a source of difficulty in achieving an economically balanced international industry and one that supports our foreign policy objectives. On occasion, U.S. entities have been forced to bargain on terms less favorable than would have been possible were there only one U.S. entity authorized to build communications links to other nations. If there were a single U.S. transmission entity, it could present a more solid position in bargaining with foreign entities.

As the INTELSAT system moves into an era of advanced development -- one in which global coverage has already been achieved -- a single entity would be in a better position than Comsat is today to reflect an overall and consistent U.S. view in the consortium. Today, Comsat's mandate is to promote only satellites. A single entity that had both cable and satellite interests would reflect a more balanced interest in efficient communications.

Some have noted that a single entity acting also as manager of INTELSAT could encounter conflict of interest problems. In this connection, we would call attention to the evolutionary trend toward a greater internationalization of the INTELSAT managership, and our endorsement in Chapter Three of greater international cooperation in the managerial function.

More generally, our international communications industry represents an important point of contact between the United States and foreign nations. A single international transmission entity could help minimize friction with foreign states, facilitate broad efforts at international cooperation, and assist and improve our relations with the developing world in communications matters.

3. It would resolve the anomalies of Comsat's role and function. The single entity solution appears to be a feasible and effective way to resolve a number of problems affecting Comsat's future. With the trend in satellite investment costs downward on a per-circuit basis, it is not clear when Comsat under present circumstances will be able to achieve a balanced capital structure. Investment in the domestic pilot satellite program and in advanced INTELSAT satellite programs will provide some improvement for the Corporation. However, a fair plan of consolidation involving the international transmission plant of Comsat and other international carriers should establish a balanced capital structure for the consolidated entity.

Creation of a single entity would also provide an occasion for resolving the potential conflict-of-interest problems created by the carriers' participation in Comsat. In the circumstances prevailing in 1962, there may have been no practical alternative to carrier participation in Comsat and to an interlocking directorate. The formation of a single entity would be an appropriate occasion to end such arrangements, for it would remove a principal justification for their presence.

Since the single entity would own the U.S. earth stations associated with INTELSAT satellites, such problems as arise from divided ownership of these stations would also disappear. Finally, Comsat's isolation from large ultimate users of communications, as a consequence of the FCC's authorized-user rulings, would also be ended since, for reasons explained below, the special circumstances in the record business that gave rise to those decisions would be changed.

4. Formation of a single entity would help resolve the problems of the international record industry. Two key issues that have engaged attention in prior studies are: First, should the record carriers be merged to promote more efficient operations, or would possible gains in efficiency be outweighed by the loss of competitive benefits? Second, does the existence of record carriers largely insulated from competition except among themselves, impose unnecessary costs on the public because the record carriers no longer provide an essential function? We believe that both of these questions can be satisfactorily resolved by a single-entity solution.

To be sure, it is theoretically possible to remove the protection now afforded the record carriers without forming a single entity. But it is far easier to contemplate such a change as part of a complete restructuring of the international industry in which the record carriers are offered the option to dispose of their assets and franchises at a fair price. We do not foreclose the possibility that the record carriers would prefer arrangements retaining some role in international communications. But if they choose to dispose of their assets and franchises, the non-transmission, non-switching properties and personnel might then devolve upon such domestic companies as would succeed them in performing functions at the service end.

The governing principle for the structure of a single international transmission entity would be that applicable generally to all situations where public policy has found the need for a public utility monopoly -- to confine the monopoly to the functions which in their nature require unity of operations.

A single transmission entity would eliminate inefficient or duplicative transmission and switching operations without necessarily foreclosing competition in other areas.

Principal areas where competitive offerings exist today in the international record business are in leased line service, switched teletypewriter and public message service and the provision of terminal equipment.[*]

The public message service is not, in any event, an attractive candidate for competitive offering and, if the international record carriers choose to dispose of their assets and franchises, the public message service might well devolve upon domestic Western Union. With respect to leased line service and switched teletypewriter service, competition need not be foreclosed. AT&T and domestic Western Union might well provide competitive services. And to the extent the existing international record carriers wish to maintain terminal and service offerings, using circuits obtained from the single entity, they would, of course, be free to do so. Moreover, competitive elements will be added by permitting the single entity to deal directly with large users where no

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[*] In the absence of restructuring the entire industry to form a single entity, the question arises as to the desirability of consolidating all or part of the record carriers' operations. Our review of the available evidence does not lead us to recommend such a consolidation at the present time, apart from the single-entity solution. It would not be objectionable, however, to give the Commission the authority to approve such consolidations when found to be in the public interest.

"customizing" of the transmission service is involved or where the user can do it himself. Finally, where feasible, other firms might in time be permitted to enter the customer-service international market and provide remote accessing of computers, message switching, subdividing or channelizing of leased circuits, and terminal gear to users as needs for such specialized services develop, and provided that appropriate procedures can be concluded where necessary for dealing with foreign entities.

5. Formation of a single entity could improve the prospects of effective government regulation. For several reasons, we could anticipate improvement in the effectiveness of government regulation. First, with the number of firms providing international transmission reduced to one, there would be no occasion to adopt regulatory policies designed to protect the weaker firms. Moreover, the single entity would constitute a relatively manageable operation from the regulatory standpoint. Lacking (as we propose below) domestic connections, manufacturing affiliation, and terminal service functions as now performed by the international record carriers, a single entity would be, in effect, no more than a transmission highway or pipeline with few major facilities and assets.

It would have easily identifiable costs and a simple rate structure. This radical simplification of the industry could materially improve the prospects for effective regulatory supervision.

The international telecommunications system is, and will remain for some time to come, quite small by domestic communications standards -- annual revenues are less than 5% of the domestic carriers' annual revenues. The problems of regulation would thus be presented on a far smaller scale. The major responsibilities of the regulator would be rate review and authorizing new transmission facilities. While such decisions would involve complex considerations, they would be required only infrequently and in a time frame permitting full examination and consideration by the government.

It is true that with a single entity owning both cables and satellites, the regulatory agency might lack the benefits of an adversary presentation on applications to build new facilities. However, one may question the amenability of investment decisions in this industry to thorough review in such adversary proceedings if the present structure is continued. In some cases, cable and satellite firms may not contest each other's applications vigorously. And in any event, review of the long term system planning required does not lend itself easily to examination in contests over specific investments. Moreover, AT&T and other major customers of a single transmission entity should be fully capable of vigorously representing their interest in efficient low-cost international communications before the Commission, even if adverse to the single entity's interest; and if competition is preserved at the manufacturing level, cable and satellite manufacturers can be expected to promote new cost saving technology with equal vigor. Since the investment decisions which must be made mainly involve infrequent, long life, large investment programs dependent on long-term demand projections and a variety of economic and non-economic factors, intensive government scrutiny of one system planner should produce better results than at present.

We are mindful of the risks inherent in the single entity being entrusted with monopoly power, even in a well-defined sector of the communications industry. But we have concluded that such risks are worth taking. Appropriate safeguards should of course be built both to maintain every incentive for cost-reducing innovation, and to assure the public reasonable rates, and high quality service.

IV. CREATION OF THE SINGLE ENTITY SHOULD BE SUBJECT TO CERTAIN CONDITIONS */

A. It Should be Limited to that Function -- The Provision of Transmission and Other Facilities -- Where the Economies of Scale are Clearly So Great That Effective Competition is Unlikely

It is unnecessary for present purposes to define the precise interface between the domestic and international communications carriers, and premature to decide now the exact structure which would emerge in the user service (as contrasted with the transmission) function in international communications. The retail service function should not in any event be provided by the single entity. The entity should sell only transmission capacity.

Under the 1962 Communications Satellite Act, only Comsat and authorized carriers may be permitted to construct and operate earth stations. Although we have recommended that the single entity assume responsibility for the U.S. earth stations in operation or planned for operation with INTELSAT satellites, this should not foreclose eventual authorization by the FCC of user-owned and operated stations, should they prove justified. We would recommend legislation to ensure that this possibility remains open.

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*/ Mr. Zimmerman (Justice) regards these conditions and safeguards -- intended to provide free access to international circuits, a competitive market in services and equipment, and effective regulatory review -- as critically important. While he endorses this paper's description of the advantages and detriments of the present structure and the proposed alternative, he regards the choice as a close one. Absent conditions, the diminution of competition from a single entity would, in his view, render it a doubtful solution. Accordingly, Mr. Zimmerman stresses that his concurrence is contingent upon the conditions and safeguards specified in this paper.

It has been argued that a carrier that had a monopoly of transmission but was not responsible for the entire communication service would be insensitive to customer complaints and demands. However, most users of international communications (save those, like the U.S. Government, large enough to purchase transmission capacity directly from the transmission entity to do their own conditioning) would not deal directly with the transmission entity. That entity would deal mainly with carriers, selling to entities such as AT&T and domestic Western Union, to certain final users, and prospectively, where feasible, to specialized service entities discussed earlier. And we suspect that the entity's principal carrier customer -- AT&T, representing most users of international communications -- would be quite able to ensure adequate performance from it. At all events, end-to-end control has never been a possibility in the international communications business. One end is always under foreign control whatever the transmission mode or U.S. ownership structure.

It has also been suggested that a split between domestic and international telephone service could endanger the quality of overseas calling from the U.S., which now benefits from the developments of the Bell Laboratories and Western Electric. To be sure, overseas calling has become an extension of domestic service (the message network is used commonly for both domestic and international traffic), and by the early 1970's, customers in the U.S. will begin dialing overseas calls just as they now dial directly distant points in this country. This will bring almost complete integration of domestic and international telephone service over a single, integrated message network.

Again, the creation of a single transmission entity should not significantly alter present relationships between domestic and international telephone service. It deserves emphasis that the transmission links of our international telephone communications are already subject to divided responsibility -- between Comsat, as a carrier's carrier, on the one hand, and AT&T on the other. Given the projected future growth of satellites as a means of international transmission, the vast bulk of our international circuits is likely soon to be carried by satellites, and even under existing arrangements would not be the responsibility of the cable carriers. Nor need a restructuring to form a single entity for international transmission otherwise affect the existing pattern of responsibility for international message telephone service. The message network commonly used for domestic and international calls would continue to be the responsibility of the domestic carrier. */

B. It Should Not Engage In Manufacturing That Can Be Provided By the Competitive Marketplace or Have Any Manufacturing Affiliations

We have already stressed that a public utility monopoly should be confined to the functions which in their nature require unity of operation. Diversity of approach is an important factor in successful innovation. Accordingly, the creation of a monopoly of international transmission makes all the more vital the preservation of competition at other levels, such as manufacturing. The satellite systems manufacturing industry is highly competitive, and if it remains so, one can expect that satellite manufacturers, competing for INTELSAT contracts, will add impetus to vigorous and rapid technological development and application by the single entity. Several companies here and abroad also engage in cable research, development, and manufacturing and in research and development of other techniques for international transmission which have promise for the future.

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*/ The appropriate arrangements for dealing with foreign entities on operating matters remain an open question.

In a rapidly developing area of advanced technology, every encouragement should be given to rivalry among firms and technologies, all with equal access to the purchaser of communications facilities. The technical staff of the entity should be capable of organizing and maintaining close and continuous relations among research, manufacturing, and operating personnel in the field, so that the lessons of operating experience would be fully available to those who design equipment and study the more fundamental aspects of international communications. For these reasons, in those areas where the development and production capability is available in the competitive marketplace, we deem it essential that the single entity be forbidden to engage in manufacturing, although we assume it would wish to undertake serious programs of research.

C. It Should Not Provide Domestic Service, Save As May Be Necessary to Permit Completion of the Pilot Domestic Satellite Program, and Should Have No Domestic Carrier Affiliation

It would be undesirable to accentuate an arbitrary distinction between domestic and international communications. To be sure, the development of satellite communications tends to blur the technical distinction between domestic and international communications and in time this may well compel a re-examination of the matter. But for the present and foreseeable future, there is greater value in continuing to distinguish between our domestic and international communications, particularly in light of our INTELSAT policies. One benefit will be to ensure diverse sources of commercial satellite communication development. Hence, we would favor confining the single entity to the international arena. We do not, however, rule out the possibility of the international entity applying to the FCC for additional earth stations at inland points for more economical origination and receipt of international traffic.*/

Our judgment that the domestic and international sectors can and should remain separate is supported, therefore, by the objective of maintaining the maximum diversity in communications common carriage as is consistent with efficient systems planning and operation. We thus reject a solution whereby AT&T would become the single U.S. transmission entity. Given AT&T's size and complexity,

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*/ See footnote, page 20 *supra*.

such a solution would, in any case, be the antithesis of creating a simple international operation that would facilitate effective government regulation.

There is concern, discussed more fully in Chapter Five, that in the pilot domestic satellite program no industry claimant for a permanent role be given a preliminary advantage over competing claimants -- an advantage that could easily become a vested interest. This concern has given rise to objections to allowing Comsat to play a major role in the pilot domestic satellite program, even though realistically it may be the best for the job at this time. An appropriate condition to adopting the single entity approach is that the entity should have only the domestic ties necessary to complete the pilot domestic satellite program. Thus, if Comsat were to help form the single entity under the conditions we have suggested, its participation in the domestic satellite pilot program as a trustee or steward would indeed preserve complete flexibility as to the eventual ownership of domestic services provided by satellite.

It would not follow from Comsat's later vacating the domestic field that AT&T should obtain a monopoly of domestic satellite communications. We recommend against such a course. There are attractive possibilities for specialized domestic satellite applications outside the common carrier public message telephone network as well as in the network. We think it premature now to define the future role of AT&T in domestic satellite communications, although it is clear that it will necessarily have a major involvement in satellite uses in the public message telephone network.

As noted earlier, the justification advanced in 1962 for allowing the carriers to own stock in Comsat and to sit on its board of directors would disappear with the formation of a single international transmission entity. Such interlocking ownership and control should be eliminated to avoid conflicts of interest, and a blurring of the relationship between customer and supplier of telecommunication service.

D. It Should be Subject to Strengthened Government Regulation

Some believe that if the government is to be intensively involved in the operations of the industry, it should form a public corporation to provide international communications, rather than continuing to entrust this responsibility to private enterprise. We are not convinced, however, that the public would benefit by substituting a public for a regulated private entity. Some of the problems associated with regulated monopoly -- such as the adequacy of incentives to be efficient -- might even be aggravated.

Mindful of the dangers of ineffectively regulated monopoly, we urge improved regulation for the international industry through a strengthened regulatory capability in the FCC as outlined in later chapters. It is our assumption that the duties imposed on the Executive Branch by the Satellite Act of 1962 with regard to Comsat would continue, or would be strengthened, if Congress should authorize a single international transmission entity. Furthermore, as discussed in greater detail in Chapter Nine, the capability of the Executive Branch to engage in economic and engineering analysis in the field of communications policy should be substantially augmented so that it can engage in those activities essential to informed and effective long-term planning, surveillance of investment decisions, and policy guidance in the international field. The Federal Government's role as a dominant user of our international communications facilities, and the importance of international communications to our foreign policy and national security, justify such extensive oversight.

V. RESTRUCTURING THE INDUSTRY WILL REQUIRE ACTION BY CONGRESS

If the formation of a single entity for U.S. international transmission subject to the conditions outlined in this chapter is accepted as a goal of U.S. policy, the question arises as to how best to achieve it. We have not attempted to lay out a detailed plan for carrying out such a program.

Whatever the precise content of the legislation which might be adopted by Congress, we recommend for consideration the following general principles:

-- that an opportunity be afforded for full hearing and for the submission of views by interested parties on the plan of consolidation;

-- that there be appropriate protection of labor;

-- that the single entity be subject to a requirement, similar to that contained in the Communications Satellite Act, that effective competition be maintained to the extent feasible in its procurement of apparatus, equipment, and services;

-- that the single entity not engage in manufacturing that can be provided by the competitive marketplace, and that it have no manufacturing affiliation, direct or indirect;

-- that the single entity should not provide domestic service, save as necessary to permit completion of the pilot domestic satellite program, and should have no domestic carrier affiliations;

-- that the single entity be forbidden to provide terminal or service functions now offered by the international record carriers, but be permitted to deal directly with users;

-- that users or carriers obtaining leased circuits from the single entity be entitled to appropriate interconnection and other arrangements with domestic carriers enabling them to make use of such international facilities;

-- that the provision of the 1962 Communications Satellite Act prescribing Executive Branch responsibilities to protect the national interest and further U.S. foreign policy apply with equal force to the single entity;

-- that the terms of all agreements among the interested parties bearing on the consolidation, as well as the capitalization and financing of the single entity, be subject to government approval;

We believe a single transmission entity approach is in the national interest and we recommend it to the Congress.

We should therefore expect those responsible for our international communications to cooperate with the Congress, the FCC, and the Executive Branch in exploring its many complexities and ramifications so as to move expeditiously toward enactment and implementation of legislation leading to a better rationalization of the industry's structure on equitable terms. But the government should be prepared to take whatever action is necessary to ensure against undue delay in this process.

VI. IF THE SINGLE ENTITY APPROACH IS NOT IMPLEMENTED, CERTAIN AMELIORATIVE STEPS WOULD STILL BE DESIRABLE

Substantial modifications in the present international communications industry structure and regulatory scheme may not be feasible except in the context of a consolidation that created a single transmission entity.

However, if a single transmission entity solution is not adopted, steps should be taken to improve the performance of the existing international communications industry. Augmenting the regulatory agency's capabilities should improve its appraisal of carrier proposals and better enable it to make the difficult choices between competing applications for transmission systems and to resist undue redundancy. Other steps to be considered by the regulatory agency are the development of ratemaking criteria related to optimal plant and modification of the authorized-user policy to allow broader direct access to the satellite entity.

We recognize that modifying aspects of the FCC's TAT-4 decision with respect to mixed voice-record traffic and its authorized-user decision would have a serious impact on the record carriers. However, if our recommendation for a single entity is not implemented, these decisions should be reconsidered in the interest of ensuring the nation efficient and economical international communications service in the future. In such a context, we would favor Congressional action to divest the international voice and record carriers of their ownership of Comsat's stock and representation on its board of directors.

CONCLUSION

The critical role the international communications industry plays in achieving our national goals justifies prompt remedial action to correct deficiencies in its structure that our study has revealed. The problems of divided ownership have not reached crisis proportions. But effective policy should anticipate problems, treat them before they become severe, and seize opportunities which could benefit the nation. Technological advance in the communications industry is rapid. The time to further reform its structure is now, when the profile of both the problems and opportunities is clear. That it will undoubtedly require several years to realize such reforms only lends added urgency to the case for prompt action.

CHAPTER THREE

THE FUTURE OF INTELSAT

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CHAPTER THREE

THE FUTURE OF INTELSAT

A basic mandate of the Task Force is to make recommendations for future policy with respect to communication satellites, and to propose ways in which this promising new technology should be integrated "into a balanced communications system which will meet the needs of a dynamic and expanding world society." Recommendations that bear on this objective appear in other chapters. Here our central concern is the International Telecommunications Satellite Consortium (INTELSAT), which was created in 1964 to establish and develop a global commercial communication satellite system. With a current membership of 63, INTELSAT owns and operates the space segment of the global system. The United States is represented by Comsat, in accordance with the 1962 Satellite Act.

INTRODUCTION

Communication through space satellites is one of the new vistas opened by modern science, and developed as an offshoot of government-sponsored research and development. When the potentiality for commercial communications through satellites clearly emerged in the early 1960's, the United States, as the leader in the field, was presented with a number of policy choices. We could, for example, have pressed our advantage in this field, and sought to develop the technology based on a narrow view of our national interest.

But we chose another and, in retrospect, a wiser course.

The new technology of satellite communications offered the promise of worldwide availability of high quality and reliable communications at reduced cost, and of enabling all countries to have more direct access to each other -- thus binding the peoples of the world into a closer community, based on better understanding and a deeper diffusion of knowledge and ideas than would otherwise be possible.

Furthermore, it was recognized that the use of satellites for commercial communications is a legitimate subject of international concern. Synchronous satellites in particular occupy orbital locations (or "parking slots") which can accommodate only a finite number of satellites without interference problems in the use of the frequency spectrum. Moreover, satellites radiate and receive electromagnetic energy potentially capable of causing interference to or receiving interference from other communication systems, both within and beyond the national boundaries of the user nation.

Recognizing such considerations, the United States in a number of national policy pronouncements and later in the General Assembly of the United Nations */ set forth the principle that communications by satellite should be made available to the nations of the world as soon as practicable on a global and non-discriminatory basis.

The future development of this technology of peace, the United States concluded, should draw on the minds and industries of many nations, which should be encouraged to share in its growth.

We therefore chose to proceed through methods of international cooperation, rather than by unilateral action, and, acting under the mandate of the 1962 Satellite Act, strongly supported the creation of INTELSAT. Our own policy in this regard corresponded to the natural and legitimate desire of other nations to participate in the development of this important new frontier of knowledge.

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*/ Resolution 1721 (XVI) of December 1961.

INTELSAT was established by two international agreements in 1964. The first is an agreement among governments declaring the basic principles on which an international cooperative program was to be built. The second, open to signature by governments or their designated operating entities, is a special agreement containing the details for the operation of the satellite system. The U.S. Government is a party to the intergovernmental agreement, and Comsat is the United States designated signatory to the special agreement.

Re-examination of United States policies regarding INTELSAT is timely because definitive arrangements, to replace the interim ones under which the consortium now operates, are to be negotiated in 1969.

The 1964 intergovernmental agreement establishing INTELSAT provides in Article IX that the governing body -- the Interim Communications Satellite Committee (ICSC) -- shall render a report not later than January 1, 1969, containing the Committee's recommendations concerning the definitive arrangements for an international global system which shall supersede the interim arrangements. This report is to follow the principles found in the Preamble of the 1964 agreement, which set as a principal objective that communications by satellite should be available to the nations of the world as soon as practicable on a global and non-discriminatory basis.

In October 1967, the United States tabled a proposal in INTELSAT for the definitive arrangements. While the proposal follows the general pattern for INTELSAT developed under the interim arrangements, it contemplates a number of changes based on experience and on the desires of other nations. The final United States position on the definitive arrangements will have to take account of continuing discussions with other nations represented in INTELSAT. It would be unwise to establish rigid positions now on the various issues that will arise in the negotiations.

Our treatment of the subject here will deal therefore, not with immediate negotiating problems, but with more general concerns. One is how INTELSAT can be made sufficiently flexible to adapt to the changing needs of members without weakening the foundations of the global system; another is the evolution of the institutional structure and decision-making process in INTELSAT needed to reflect the changed circumstances since its creation.

I. THE INSTITUTIONAL FRAMEWORK

Under the present arrangements, each INTELSAT member contributes to the cost of developing and establishing the space segment of the global system on the basis of quotas related to expected use. The United States investment share in INTELSAT is now about 53%. The space segment, consisting principally of the satellites, is owned in undivided shares by all members in proportion to their respective contributions to the costs. In contrast, the earth stations that transmit to and receive from the satellites are separately owned and controlled by national operating entities in the countries where they are located.

Decision-making responsibility for INTELSAT rests with the Interim Communications Satellite Committee (ICSC). Voting power in the ICSC is in proportion to each member's space segment investment quota based on use. The ICSC now consists of 18 representatives who speak for 48 of the 63 parties presently in INTELSAT. These 48 members represent about 97% of the total space segment investment. Voting in the ICSC on specified important matters requires the concurrence of 12.5% of the votes, in addition to that of the United States.

The intergovernmental agreement provides that Comsat be the Manager for INTELSAT, pursuant to the ICSC's general policies and in accordance with its specific determinations. Comsat, as Manager, recommends the type of space segment to be established, operates and maintains the space segment, and places contracts relating to the design, development and procurement of equipment for the space segment. However, ICSC approval must be sought on all major aspects of these activities.

INTELSAT provides satellite service at rates based on units of space segment utilization and intended to cover amortization of capital, return on investment, and operating, maintenance and administrative costs. The level of charges for units of space segment utilization is based on the revenue requirements of the entire space segment, and the unit rate is, accordingly, the same in all satellites. INTELSAT does not determine the rates that its members establish for satellite service to their customers.

II. THE SUCCESS OF INTELSAT HAS DEMONSTRATED THE WISDOM OF OUR COMMITMENT TO A GLOBAL COMMUNICATION SATELLITE SYSTEM

INTELSAT has demonstrated the value of communication satellites in actual operation. There are four satellites of the INTELSAT I and II series in operation in the Atlantic and Pacific areas. With the launch of an Indian Ocean satellite, expected in a matter of months, INTELSAT will have established worldwide coverage by satellites. The three INTELSAT II satellites launched during 1967 each have capacity of 240 two-way voice circuits.

INTELSAT III series satellites shortly to be launched will have a design lifetime of 5 years and capacity of 1200 voice circuits. Contracts have been awarded for even more advanced satellites, of the INTELSAT IV series, each of which will have at least 5000 voice circuits and far greater operational flexibility. INTELSAT satellites serve a variety of communication needs, including voice, record, data and television traffic, and studies are being undertaken to examine the feasibility of providing via satellites other communication services, e.g., to aeronautical and maritime customers.

When INTELSAT began with only a handful of members in 1964, the full promise of this mode of communication was still unproven. Today, almost two dozen earth stations throughout the world are linked up with its satellites, including four in the United States. By 1972 an additional

40 to 50 earth stations are expected to be operational.

Under procurement policies established by INTELSAT, the industries of the world are being steadily drawn into its activity. At first, United States industry was virtually the only supplier of equipment for INTELSAT. A measure of the progress made since then in diversifying procurement sources is that about 30% of the INTELSAT IV satellite program -- over $19 million -- will be carried out in other countries. And in the earth station field there is particularly healthy competition among firms representing many nations.

There has been a steady growth in the use of INTELSAT satellite facilities. Already, some 306 circuits are being provided among Atlantic Basin nations via these facilities, and by 1972 this number is expected to reach 2230.

It is clear, then, that the foundation laid by INTELSAT is a solid one, and its future bright. The United States, in our view, should firmly continue to support the goal of developing and perfecting the global system.

But in considering the future of INTELSAT under definitive arrangement, we should carefully take into account both developments since its formation and those now in prospect.

Early planning for a global satellite communication system envisioned the use of random-orbiting satellites. At that time, the promise of commercial communications satellites seemed greatest in spanning very long distances, primarily across ocean areas. With the successful launch of Syncom II in 1963, INTELSAT decided to use synchronous satellites for the initial global system, and has subsequently followed through with 4 generations of synchronous satellite technology, which has evolved rapidly over the past 6 years. Declining costs and new developments, such as more powerful satellites and highly directive, multiple-beam satellite antennas enabling limited coverage, may permit more widespread and varied uses, including economic satellite programs servicing small areas of the globe.

Recognizing that the new technology could have useful domestic applications, we propose in other chapters of this report that the United States establish a pilot domestic satellite program, and that the use of satellites for domestic and regional services in less developed countries be thoroughly explored.

The only other country that has developed a system for providing domestic satellite services is the Soviet Union. Canada recently announced that it plans to establish a domestic satellite system, and interest in specialized satellite applications has been expressed in other areas of the world as well. These developments underscore the importance of assuring harmonious development of the new technology in ways which best serve the needs of members. It will be especially important to fashion procedures in the definitive arrangements for relating the emergence of specialized satellite services to INTELSAT, and to ensure that INTELSAT can best serve the needs of its members in the rapidly changing technological environment.

III. THE DEFINITIVE ARRANGEMENTS FOR INTELSAT SHOULD BE SUFFICIENTLY FLEXIBLE TO ADAPT TO THE CHANGING NEEDS OF MEMBERS AND TO ACCOMMODATE SPECIALIZED SATELLITE FACILITIES WITHOUT WEAKENING THE INDISPENSABLE FOUNDATIONS OF THE GLOBAL SYSTEM

One of the basic principles of this report is that we be guided by the goal of achieving a legal and economic environment which encourages and stimulates cost-reducing progress, both in technology and in management. This principle is of universal value in examining problems of economic organization. It is particularly apposite for an area of such rapid technological change, as communication satellites.

With this principle in mind, we have carefully examined the underlying premises of the global system. The global system enables substantial economies of scale to be realized. This is true because large satellites are capable of flexibility in use and provide high communications capacity and lower costs per channel. They also permit economies in the use of earth stations. This fact is of special importance to the developing countries, whose communications systems are often still limited, costly and indirect. There are other important advantages to a global system in integrated system planning, financing, procurement, management, and control. We also look to INTELSAT to demonstrate the value of broad international cooperation, while recognizing that INTELSAT's success is best assured if it rests on a firm economic foundation.

Looking ahead to the future needs of members of INTELSAT, we would be wise to avoid any approach that stifles technological innovation, or relies upon a particular theory regarding the future evolution of satellite technology.

Proposals for specialized satellite facilities should be viewed in terms of their compatibility with the objectives of the global system to which all members of INTELSAT are committed.

The concept of compatibility should include the economic integrity of the global system. Plans for specialized satellite facilities should be developed through consultations between INTELSAT and the member or members concerned. In the development of such plans, differing patterns of cooperation between INTELSAT and the members could be arranged, as might be appropriate.

Nations might wish to obtain specialized satellite services for a variety of reasons, not necessarily inconsistent with their commitment to the global system. It would, however, be of concern if this were to lead to a proliferation of competing systems -- small, often suffering from high unit costs, and together denying to the world much of the potential benefit from technological progress in satellite communications.

There are powerful forces at work for continued development of a strong global system, stemming from the inherent advantages of a global system for international communications --

global access is assured with far fewer satellite and earth station facilities and, consequently, at substantial savings.

Whatever their specialized requirements may be, members of INTELSAT should be most reluctant to participate in a system actually designed to compete with the global system, because of the unnecessary expense this would entail in terms of duplication of facilities.

A satellite facility designed for purposes other than the provision of common carrier communications which INTELSAT is prepared to provide would present special considerations. Where no particular advantage accrues to the global system or is to be derived from using it, there could be no objection to an outside project. However, this is not to say that INTELSAT should be limited in its scope; it should be able to offer all sorts of services as may be appropriate to meet its broad aims.

Any specialized satellite facility should be compatible with INTELSAT's use of the frequency spectrum and orbital space; the proposed mechanism and technique for its control would have to be adequate; and radiation emitted from the satellites should cause no harmful interference to INTELSAT satellites or associated earth stations.

If a specialized satellite facility were thus compatible with the global system, the member or members concerned still should consider with INTELSAT the mutual benefits that might flow from relating it to the global system. Areas of potential mutual benefit could include sharing of joint research and development costs, common procurement, shared use of telemetry and control facilities, joint arrangements for satellite launching, and sharing of in-orbit satellite spares or on-ground backup facilities.

As we are on the verge of a new era in the use of communication satellites, INTELSAT will have a key role by providing a reservoir of expertise in satellite system planning. It should continue to be the focal point for coordinated planning for the most effective global utilization of satellites, and should likewise serve as a forum for coordinating plans for specialized satellite uses.

IV. INTELSAT'S INSTITUTIONAL STRUCTURE AND DECISION-MAKING PROCESS SHOULD BE MODIFIED WHERE NECESSARY TO REFLECT CHANGED CIRCUMSTANCES SINCE ITS CREATION

The continued development of INTELSAT requires a firm foundation. The negotiations in 1969 should facilitate resolution of a number of questions affecting governments. On the other hand, if INTELSAT is to continue as an efficient operational organization, its day-to-day work should continue to be carried on by the operating entities which now participate in the consortium.

In approaching the future organization of INTELSAT, the United States should be willing to consider adjustments of structure which could lead to a new pattern of cooperation within the consortium. The major role of the U.S. in INTELSAT today reflects, quite naturally, our leadership in the field of space technology, as well as our position as dominant user of INTELSAT satellites. It is not surprising that the present arrangements mirror these facts.

As the INTELSAT system matures both in membership and in scope, the U.S. role will naturally alter. Broad participation by other members will remain an important objective, and nations that have not yet sought membership can and should be encouraged to consider it.

The present decision-making process in the Interim Committee is effective. On the whole, decisions have been made in timely fashion, and without undue controversy. There are many advantages in centering decision-making in a relatively small, cohesive body such as the ICSC. A governing body designed along the lines of the ICSC, and with similar powers, should be the principal decision-making body of INTELSAT under the definitive arrangements.

Any standard selected for calculating voting power on the governing body should be on as rational a basis as possible. The standard selected for the interim arrangements -- space segment investment quota -- has been a workable one. The United States proposals presented in the ICSC have suggested that under the definitive arrangements the voting power of a representative be directly proportional to the investment share of the member or group of members he represents, and that investment, in turn, would be proportionate to the member's use of INTELSAT-financed space facilities. There might be other acceptable voting formulas; but any formula should adequately reflect the fact of widely varying contributions to the organization, and the objective of operating an efficient and effective communications enterprise on a businesslike -- rather than a political -- basis.

An adequate opportunity must also be provided for even the smallest member to be heard. This is particularly important since decisions regarding the design of the system -- taking into account the interrelationship between space and ground segments -- will have a direct bearing on the attractiveness of the system. Members will view the overall design of the system from different perspectives. We are concerned that the developing countries be fairly represented, since well over 60% of the ground stations -- representing a major part of the total system investment -- now planned for operation with INTELSAT satellites by 1972 will be established in developing countries.

To ensure increasing participation by developing countries, the conditions required for access to the governing body might well be eased, within limits necessary to ensure that the governing body does not grow unwieldy. The United States has already proposed that, under the definitive arrangements, any five members of INTELSAT would be entitled to representation on the governing body even if their combined investment share were less than the minimum otherwise required for representation. Other approaches to the question should also be examined.

To ensure that all members of INTELSAT have an opportunity to participate in its affairs, we have also proposed that an assembly of members, meeting annually, would be desirable. There have been various suggestions regarding the role of such an assembly and the mechanism by which it would reach decisions. The United States should remain receptive to all such suggestions.

The role of the Manager will also be considered in the forthcoming negotiations. We have proposed that Comsat serve as Manager under the definitive arrangements pursuant to a management contract concluded with the Governing Body -- with the main features of the Manager's functions to be spelled out in the definitive arrangements.

While recognizing the important contribution that Comsat has made thus far as Manager of INTELSAT, some members have expressed the view that broader participation in the execution of this responsibility is desirable in the future. In this context, we note that Comsat is now in the process of implementing a recent decision to establish a distinct division within the corporation to carry out its duties as Manager of INTELSAT. Increasing numbers of foreign personnel have served with Comsat since the inception of INTELSAT; they will now be able to work in the new division.

We endorse such steps in the direction of greater international cooperation in the managerial function.

V. INTELSAT SHOULD REMAIN FREE OF EXTRANEOUS ISSUES

In considering the desirable shape of INTELSAT's institutional structure and decision-making process under the definitive arrangements, we are mindful that the organization is becoming increasingly attractive to many non-member nations because of the global coverage it provides, and the efficiency and economy of its services. If it is to continue its established record of growth, INTELSAT should, as in the past, continue to provide a forum in which communications matters, and not extraneous issues, are central. Political alignments and differences need not and should not have a place in such an organization.

It is hoped that those countries which have remained apart from INTELSAT will reconsider the advantage of participation in INTELSAT. It should be possible to find a way to accommodate their legitimate interests and requirements within the flexible framework of the global system.

CHAPTER FOUR

SATELLITE COMMUNICATIONS AND EDUCATIONAL TELEVISION IN LESS DEVELOPED COUNTRIES

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CHAPTER FOUR

SATELLITE COMMUNICATIONS AND EDUCATIONAL TELEVISION IN LESS DEVELOPED COUNTRIES

The President's message on communications policy gave stress to the communications problems and needs of the less developed countries. The Task Force has, therefore, appraised the prospects of telecommunications helping such countries overcome their problems and evaluated policies which this and other countries might adopt in order to assure that the prospects are realized. Accordingly, we have studied as illustrative examples the needs and possibilities of two representative, but quite different, areas of the less developed world: Latin America and India. Of course, this selection does not imply that these two areas are necessarily the most attractive for satellite or instructional television applications.

Our general conclusion is that the prospects are favorable for expanded and much more efficient use of telecommunications by the less developed countries. Satellites can make a significant contribution to this advance. However, for these prospects to be realized, new planning capabilities are required.

I. THE LESS DEVELOPED COUNTRIES VITALLY NEED BETTER COMMUNICATIONS, BOTH INTERNALLY AND WITH THE REST OF THE WORLD

The process of economic development requires the acquisition of a modern telecommunications capability, for telecommunications is part of the essential infrastructure of any developed industrial nation. Effective government, domestic and foreign trade, transportation, modern industry, and national unity all require good telecommunications. In the form of television, telecommunications offers substantial promise of helping to solve the serious educational and population problems of the less developed world.

At the outset, we would emphasize that sound development of a nation does not result when a few limited locations are provided sophisticated and advanced telecommunications systems while the substantial remainder of the nation goes undeveloped. It would be mistaken to consider the development of a few international earth stations or a few broadcast reception terminals within a nation without devoting attention to the development of communications facilities within and between countries. Balanced telecommunications progress requires the expansion of the domestic infrastructure, including modern local exchanges and adequate numbers of telephones, as well as links among the various cities and towns.

As discussed more fully in Chapter Three, striking progress is being made through INTELSAT with respect to a global communications network including the less developed countries. At this writing 55 countries, including 40 of the less developed, have ground stations scheduled for completion by 1972 to work with INTELSAT satellites.

Both to serve the needs of domestic development, and to fully exploit the INTELSAT global system (which initially will link only the largest cities of the participating countries) it is important that domestic telecommunications networks be greatly expanded. Unfortunately, communications links within less developed countries are generally rudimentary and unreliable -- where they exist at all. High-frequency radio, subject to vagaries of the atmosphere, is still relied upon to connect many major cities. And nationwide electronic distribution of television programming, commonplace in the United States and Europe, is virtually unknown in less developed areas.

II. MULTI-PURPOSE SATELLITE FACILITIES HAVE SUBSTANTIAL PROMISE FOR LATIN AMERICA

A. There are Important Areas of Demand Which Satellites Might Meet

Much of Latin America's population is scattered over towns and cities separated by rough, uninhabited, sometimes forbidding terrain. It is quite natural to think of telecommunications development in these circumstances primarily in terms of the communications satellite. Satellite costs are largely independent of the distance between earth stations or the character of the intervening terrain, and satellites appear particularly economic as a method of linking up widely separated points having relatively low traffic requirements.

In order to judge the attractiveness of satellite services for Latin America, it is necessary to have some idea of the extent and character of the region's physical environment, stage of economic and telecommunications development, and the possible range of opportunities. This is not an easy task. In the case of telephone, the prevalence of "concealed" demand (i.e., potential users discouraged by the existing inadequate facilities), the unknown effect of rate changes, and other factors, make the forecasting of communications demand in the less developed world especially difficult. However, a study conducted for the Task Force by Page Communications Engineers does clearly show that for these countries domestic demand is likely far to exceed international. While much of the domestic demand in Latin American countries may involve distances too short for satellites to be more economical than terrestrial alternatives, even a small percentage of the region's demand may provide a sufficient base for economically attractive satellite facilities.

In addition to telephone, telegraph and data service, the use of satellites for television has considerable potential. It would permit each capital city to distribute timely public affairs and news programs on an instantaneous basis to numerous points within its national boundaries.*/ In addition, programming from international sources (such as coverage of major news and cultural events) could be transmitted by INTELSAT satellites to the several large earth terminals already planned or under construction in the region. From these terminals satellites could be used to relay the program to outlying areas. The television distribution system would also be useful for classroom instructional purposes. Thus, one could visualize a channel being employed during the day for instructional purposes in the classroom, and during prime time evening hours for entertainment, public affairs and news programs. As the occasion arises, especially important international public affairs programming could be brought in to preempt regularly scheduled national programming.

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*/ We emphasize the phrase "national boundaries" because special political and legal considerations would affect the extent to which countries would accept television programming beamed from other countries for consumption by their national audiences.

However, one question which immediately arises with respect to instructional television is: "Why use a satellite?" Since instructional television is generally "canned," what benefit is connected with instantaneous transmission to individual receiving points? If local television stations are in any event needed, would it not be less costly to distribute video tape through the mail for local rebroadcast by these stations?

There are four considerations which make instantaneous transmission especially attractive:

-- While video tape distribution for local rebroadcast is likely to be much less expensive than a satellite system dedicated solely to instructional television, the additional cost of using the satellite for instruction may be low if the satellite is at the same time employed for other purposes such as telephone and public affairs television. Or, if it is desirable to beam timely public affairs programming to the home and to the village square, for which instantaneous electronic distribution is essential, then the additional cost of using the same channel during the day for classroom use would be small.

-- The low cost embodied in video tape distribution is very much dependent upon local use of particular tapes in accordance with prearranged schedules and then mailing them in sequence to other local users. However, unless mail and transportation systems are good, and the competence of local personnel is high, the snowballing of delays and missing tapes can lead to a crashing fiasco. Unfortunately, mail systems and transportation are typically not reliable in less developed countries -- especially in the isolated areas one would be particularly interested in reaching by satellite.

-- It would sometimes be desirable to bring to the classroom programs of particularly timely interest, to make _ad hoc_ revisions in televised lecture material to reflect recent events and experience, and more generally to retain the option of changing programming on short notice -- things which can be done satisfactorily only with instantaneous distribution.

-- A widely-voiced complaint concerning instructional television is that it is totally passive -- that it does not permit members of a large audience in a learning situation to interact with the teacher appearing on the screen. But here, since the satellite would provide telephone channels along with television, exciting possibilities emerge for designing an interactive feedback system to employ voice channels, particularly during off-peak periods of telephone use. For example, we could visualize a television channel, combined with telephone links to the originating studio in the capital city, employed for teacher training sessions; small groups of teachers scattered throughout the country could ask questions, get immediate answers, and enjoy a shared participation with those in the studio.

Against these considerations, it must be recognized that nationwide distribution via satellite may suffer handicaps in particular situations. A major educational constraint is that the less locally tailored the programming, the less likely it is to be effective. Thus, a trade-off exists between the scope of satellite coverage and its instructional effectiveness.

B. Estimated Costs of Satellite Facilities, Designed to Meet these Demands, Compare Favorably with those of Terrestrial Alternatives

Among the various satellite possibilities which we have studied with respect to Latin America's telecommunications needs, one of the most interesting involves a satellite with four beams covering South America, working with relatively low-cost earth stations in all the 125 cities with populations in excess of 50,000. */ Each city would have 50 to 250 voice channels, depending on its size, and one television receive channel; at least one city in each of the 10 countries covered by the satellite beams would also

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*/ The model was developed by the Central Staff from data provided by NASA, The Electronic Industries Association, Page Communications Engineers, General Electric, and Hughes Aircraft.

have a television transmission channel to cover its own national population.*/ Thirty-five percent of the continent's population would be directly served by the system. While cost estimates are necessarily subject to great uncertainty at this early stage, this system might involve a total 10-year investment cost of perhaps $80 million, and an annual operating cost of about $3.5 million. At roughly twice the cost, the coverage of the system could be expanded to an additional 403 cities and towns accounting for an additional 12 percent of the continent's population.

Planning and construction are already under way on an Inter-American Telecommunications Network (ITN) designed to interconnect the continent's major cities, mainly by terrestrial microwave links. However, even if we presume that

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*/ It should be noted that the most significant school uses of educational television would surely require more than one channel. Perhaps the most useful combination would involve the satellite for programming a national curriculum, while local television production, using other channels, would provide supplementary locally-tailored programming. Of course, if more than one channel is required by satellite, a much larger system than is considered in our illustrative example could be built.

ITN is completed as planned, the additional cost of expanding it with microwave facilities to provide the same level of service contemplated in our satellite model would be significantly greater, according to our studies, than the cost of the satellite system. Moreover, ITN is far from complete. As it now exists, ITN represents a mixture of on-going construction, firm plans, attractive prospects, and hopes. If satellite facilities were substituted for some portion of ITN, they would enable substantial additional cost savings. Of course, we do not mean to imply that plans for ITN should be scrapped and satellite facilities substituted. What we do suggest is that the prospects for satellites merit careful appraisal as part of a mixed satellite-terrestrial network in Latin America.

Of course, the facilities described here are only illustrative. At this time we cannot say what the optimal level of coverage and capacity would be for either an initial or a more advanced system, nor do we have precise estimates of costs. What our study strongly suggests, however, is that potential applications are promising, and that satellite facilities could be tailored to meet the needs of the countries served. Major decisions would require much more detailed analyses of the comparative costs, benefits and feasibility of satellite applications and other alternatives.

C. Regionally-Shared Satellites Would be Compatible with INTELSAT and with the Needs of Spectrum Conservation

It is notable that regionally-shared satellite facilities would complement and strengthen a global satellite system; by "collecting" domestic traffic it would expand the demand for intercontinental service supplied by currently programmed INTELSAT satellites. We have already mentioned that television programming originating on other continents could be transmitted by INTELSAT and re-transmitted via the regional satellite facilities to reach additional cities, numbering a hundred or more, depending on the factors noted above. In addition, regional satellite facilities would provide the "tail-end" extensions in the participating countries for telephone, data and record service involving overseas points. That is, traffic could be routed between the outlying towns and cities to major cities where the large INTELSAT ground stations are located. From there, the traffic would go by INTELSAT to Europe, to the United States, Africa, or anywhere else in the global system. To be sure, this would require two hops, which would result in somewhat degraded telephone quality because of the time delay. Nevertheless, given the reliability and general quality of international service that would be provided to outlying points, in contrast to the exceedingly poor service existing today, a two-hop delay might well be tolerated by most users.

Some fears have been expressed that the proliferation of satellites would lead to a crowding of the orbital "parking slots" most suitable for satellite communications, as a result of spectrum limitations. For several reasons we doubt that this problem will become serious in anything like the foreseeable future: First, the orbital space that would be most useful for the South American continent would fall conveniently between the longitudes most useful for U.S. and Canadian systems on one side and longitudes most useful for an INTELSAT transatlantic system on the other. The best positions for U.S. and Canadian satellites would be over the Pacific Ocean to the west of Ecuador. The best position for transatlantic satellites with good coverage of Western Europe is near the bulge of Africa. The 45 degrees of longitude directly above the South American continent would not overlap these areas. Secondly, this 45 degrees of orbital space would permit a number of satellites -- perhaps 5 or 10 -- with a total capacity for Latin America far greater than anything we can envision being needed by 1980 -- or indeed well beyond. Third, as traffic grows in the more distant future to require many satellites, orbital space might become increasingly crowded. But during the same time technology will also advance to afford more efficient use of spectrum. Narrower beams can be designed to cover selected portions of the earth and permit reuse of the same spectrum and orbital space by several regions simultaneously. For example, a satellite covering the southern regions of South America could use the same spectrum space in the same orbital slot as a satellite covering portions of the United States or Canada without mutual interference. Likewise, a narrow beam satellite covering East Africa would not interfere with a different satellite in the same orbital slot beamed to Western Europe.

D. The Most Difficult Problem is That of Regional Coordination; INTELSAT May Provide the Answer

Over the next few years the large economies of scale inherent in satellite technology will very probably be best exploited if facilities designed for Latin America are shared among a number of countries. In most cases, it would be highly uneconomic for Latin American countries separately to orbit satellites to serve their own domestic telephone and television needs. As technology progresses and traffic demands grow in the more distant future, perhaps it may become economic for separate small countries to have their own systems. In the meantime, the economic appeal of satellites rests largely on the condition that the system be spread over a number of countries. But sharing a satellite system among a number of countries obviously requires a high level of cooperation with respect to such factors as satellite design, spares and replacements, launching arrangements, procurement, earth station design, traffic loading, and control and telemetry.

Of basic importance to satellite use is the need for a special degree of international cooperation differing substantially from the more traditional form of cooperative arrangements that govern terrestrial alternatives such as cable and microwave relay. Participating in a satellite system that provides domestic service, a country would become dependent for its domestic communications needs on facilities over which it does not have total control.

The reliability and capacity of communications links, the cost burden borne by the country, the time phasing of the services, and other matters would depend partly on the actions of other countries -- what kinds of services other countries desire; whether agreement is reached about common procurement of ground stations, etc. In contrast, a microwave system built for domestic use would be entirely under the control of the national government. Though, as suggested earlier, microwave might involve a total cost considerably greater than that of satellite, the country would be free to choose its own hardware, build microwave links whenever and wherever it pleases, and provide whatever services it desires.

This is not to say that it would be impossible to achieve levels of international cooperation required to develop and operate regionally-shared satellite facilities. The best solution might well involve INTELSAT establishing and maintaining the satellite portion of the system. In this case INTELSAT would procure and place in orbit the satellites (tailored to the needs of its users), provide backup satellites and other facilities, undertake the telemetry and control functions and, in general, perform all the other tasks associated with implementing and maintaining the space segment. Each user might reimburse INTELSAT for its share of the space segment in proportion to use, while it would own and operate its own earth terminals.

Using INTELSAT has several advantages, not the least of which is simply the fact that it is an organization with many members. While each participating country would necessarily face the prospect of not being in complete control of its telecommunications facilities, it would at least have the assurance that the responsibility for the space segment would be shared by many members with no serious risk that the organization would become dominated by one or a few potentially unfriendly neighboring countries. One might imagine a small country being reluctant to join a four-nation group to put up a satellite, on grounds that such a grouping would likely be dominated by the largest one or two members. If, on the other hand, the forum for cooperation were more broadly based, as in INTELSAT, the attraction of participation could be markedly enhanced.

Another advantage of an INTELSAT arrangement is better exploitation of economies of scale. We have assumed that a separate satellite would be used to serve the domestic needs of a continent the size of South America. With the kinds of technology available in the early 1970's, in the light of anticipated demand, this is probably a safe assumption. However, as technology advances in the more distant future, it could become technically feasible and economically attractive to serve a wide variety of domestic, regional and intercontinental needs throughout the Atlantic basin from a single satellite. Thus, a satellite over the Atlantic, with a large number of separate narrowly-focused beams, might simultaneously provide domestic and regional service both in Latin America and in Africa and at the same time provide intercontinental links among all major points, including the dense routes over the North Atlantic. If such an approach seeking to reduce unit costs to all users should eventually turn out to be attractive, working through INTELSAT from the outset would facilitate its adoption.

The prospects for regional cooperation in the use of satellites will be enhanced if the 1969 INTELSAT definitive arrangements establish a flexible framework within which the specialized satellite needs of groups of members -- as well as individual members -- can attractively be met by going to INTELSAT. Such a framework would facilitate regional cooperation in the use of satellites by all countries, regardless of their stage of development.

III. A NATIONWIDE TELEVISION SYSTEM OFFERS PROMISE FOR INDIA

A. India's Staggering Problems in Regard to Telecommunications Require a Strict Set of Priorities

The less developed regions differ greatly from each other, and for that reason it is impossible to apply the same regional model everywhere. The contrast between Latin America and India is striking. Interconnection of all of the cities and towns of South America having a population of 10,000 or more would embrace 47% of the population of these countries. In contrast, only 20% of India's population lives in urban areas, the remaining 80% being scattered among some 568,000 villages. Since only 20% of these villages are expected to have electricity by 1974, the creation of an inclusive electronic communications network is out of the question in the near term. With only 5400 miles of microwave or coaxial cable links, and a telephone to population ratio of 2 to 1000, India's telephone and telegraph industry is in its infancy. Moreover, the country has only one television station, and 6000-7000 television receivers.

Of special significance is the fact that India is severely fragmented in terms of language and culture. Fifteen official languages exist, thirteen of them spoken by more than 10 million people. Sixteen unofficial Indian languages are spoken by more than half a million people each. Altogether, there are over 800 recognized languages in India.

With problems and obstacles to development so formidable, improvement of the subcontinent's telecommunications in the near term would be facilitated by a strict set of priorities modest in scope and aspiration. A relatively small scale television distribution system utilizing satellites might represent a realistic and promising first step.

B. Television Offers Hope of Ameliorating Some of India's Serious Problems

In the opinion of India's leaders and of outside observers, the subcontinent's salient need is to create a sense of national unity and integration among a culturally, religiously and especially a linguistically diverse people. Television could give Indians an opportunity to share common experiences, enable Indian leaders to communicate more effectively with the entire nation, and contribute to mass participation in the major events of national life. Television may also have an important application in assisting

India to overcome another fundamental problem: inadequate education. It is less the number of schools or teachers than it is the quality of education that is inhibiting national development. And it is precisely in improving quality that television could be expected to make its principal contribution. Television enables the exceptionally skillful and well-trained teacher to reach a vastly greater number of students than he could possibly reach in the classroom, thereby enabling the greater utilization of the nation's scarce educational resources.

From a more utilitarian perspective, television also offers substantial promise of helping to rid India of its age-old problem of famine, by communicating advanced agricultural productivity. Finally, television may have value in combating a variety of other grave national problems -- such as that of overpopulation, through dissemination of birth-control information.

To be sure, radio is also an important medium for such tasks, and has the advantage over television of already reaching the bulk of the population. Lacking the visual dimension, its impact is, however, inherently much more limited -- especially for educational uses that require pictures, diagrams and visual demonstrations.

Printed media also can contribute. But their circulation and penetration in India are very shallow and are severely handicapped by pervasive illiteracy.

C. An Initial Satellite System Covering the Major Cities and Surrounding Agricultural Areas Appears Attractive, Although Substantial Problems Will Have to be Overcome

In the long term, it is possible to envisage a satellite or terrestrial television distribution system which would reach most of the Indian population. But many years will be required to build up the electrical and transportation infrastructure to the point where television receivers can be operated and maintained at reasonable cost throughout the entire populated area of the subcontinent. For the near term, it would be unrealistic to consider a television system outside of the major cities and surrounding villages (e.g., the 79 cities that have populations of 100,000 or more), in which electricity, transportation and service facilities are adequate. A multi-purpose satellite, not unlike that discussed earlier in connection with Latin America, could provide perhaps 5000 telephone channels plus three television channels for the 79 cities (and surrounding agricultural areas) with populations in excess of

100,000. This capacity would be sufficient to broadcast 35 hours a week to each of 12 language groups. The system could be expanded later to serve additional population centers as the necessary infrastructure developed.

We must carefully note, however, that the greatest difficulties encountered in establishing and operating such a system would involve not hardware design, but rather a host of other factors: developing good and effective programming, getting support and cooperation from schools and teachers, organizing and training people to use television effectively, and many others. Like most less developed countries, India has an inadequate number of technically and professionally skilled personnel, especially in the areas most vitally involved in a satellite television system -- communications and educational technology, broadcasting, the design and administration of educational television curricula, the interface with the conventional educational system, and overall administration of novel and complex public institutions. Television systems require not only a system coordinating large numbers of people in many different specialities, many of whom will be dispersed over large and remote areas; they also require a degree of efficiency and precision in operation rarely found in any less developed country: Programs must appear on time, program schedules must be known in advance throughout the country, supporting materials must be supplied on time, and technical interruptions of services must be minimized.

A promising step in moving forward is the planned experimental use of a NASA satellite for television in India. The project was conceived nearly three years ago when NASA recognized that the ATS satellite series would, early in the 1970's, reach a stage which would permit experimentation with television broadcasting over a controlled area into augmented standard TV receivers for community reception. Studies have shown that such modification can be accomplished at costs ranging from $150 to $500 or $600, depending upon the numbers produced, location for use and similar factors.

The experiment will offer India an important and useful domestic tool in the interests of national cohesion. It will provide a first and major test of educational television for the practical instruction of illiterate adults.

The experiment has already stimulated a domestic TV manufacturing enterprise in India with important managerial, economic and technological implications. Above all, it should provide information and valuable experience for future applications elsewhere.

IV. IN GENERAL, INSTRUCTIONAL TELEVISION DESERVES A HIGH PLACE IN THE EDUCATIONAL PRIORITIES OF THE LESS DEVELOPED WORLD

On the basis of our case studies and other research, we are inclined to believe that educational television may prove highly beneficial to the less developed world in general, if the problems involved in its use are clearly recognized. It goes without saying that the extension and improvement of education are matters of the highest importance to a nation which desires to escape from poverty. Education in the less developed world is characterized by its heavy reliance on rote memorization instead of analysis, by curricula and subjects which are often antiquated or irrelevant, by a desperate shortage of teachers and especially of skilled and trained teachers, by lack of teacher training programs and facilities, and by student apathy.

As a complement to the many other valuable tools of education, television could make a tremendous difference.

Experiments in American Samoa, in Colombia, and elsewhere indicate that television is well adapted for teacher training, that it lends itself to uses which strengthen teacher-student responses, and that it excites students about the possibilities of education. In addition, of course, television multiplies the reach and effectiveness of the highly skilled teacher and is ideally suited to the presentation of a contemporary curriculum which includes scientific demonstrations and other visual aids vital to vocational and scientific education.

What is especially important to emphasize, however, is that successful exploitation of the medium's potential requires planning and personnel of a high order. A successful program of instructional television requires, as we stressed in our discussion of India, a rare combination of technical and educational expertise, administrative competence, and firsthand familiarity with the challenges and difficulties of adapting television to the educational needs of the less developed world. Without a proper appreciation of the magnitude of the task and an effective approach to the problems of program design and operation, instructional television is apt to prove an enormous disappointment in practice.

More specifically, from our studies of educational television we conclude the following:

1. Success requires a very serious commitment to educational change from those in top political and educational positions.

2. In order to achieve a major commitment, and to maintain it by demonstrating its success, television must be used -- or at least must be planned ultimately to be used -- for achieving fundamental solutions to priority educational problems. It must be thoroughly integrated into the educational system.

3. Planning must proceed from an analysis of the problems in local conditions, not from a blueprint for introducing a technology.

4. It is essential that programming be as relevant as possible to the individual student. Substantial parts must therefore be locally produced. The reach of any central system is determined by the homogeneity of the population.

5. The systems characteristics of the educational process, with all their interrelatedness, must be fully

recognized in planning the use of television. Many technical, organizational, and human elements must be given equal attention, for significant failure in any one of them will disrupt the entire system.

6. The systems which require complicated interaction between technical systems and human or organizational systems -- e.g., the training of repairmen and provision of an efficient repair service -- are more difficult to master than the merely technical elements in the operating environments most likely to be encountered.

7. The organizational and human elements demand most of the energy, imagination, and the application of resources. Organizational efficiency, teacher and student attitudes, coordinated teamwork, training, and like problems require complex planning, enlightened administration, and, most important, a very strong will to succeed.

V. WE RECOMMEND THAT A NUMBER OF INSTITUTIONAL AND PLANNING MEASURES BE UNDERTAKEN TO ENABLE CONSTRUCTIVE DEVELOPMENT OF TELECOMMUNICATIONS IN THE LESS DEVELOPED COUNTRIES

On the basis of our research and analysis, we are persuaded that telecommunications may be an important key to economic development in the less developed world. To turn that key, however, will require careful, informed and sustained attention to the many problems of regional coordination, technical and educational design, and administration and operation, mentioned previously. Here we describe some mechanisms whose prompt establishment, we believe, would make this task more manageable.

A. Multi-national Educational Training Centers

We favor the creation of centers to promote the ability of individual countries to determine their own needs and objectives, determine what resources can best be applied to meeting these needs and objectives and initiate action toward their achievement. Among its missions, these centers would provide information to educational authorities and other public servants involved in the problems of educational development on the advantages of the use of technology for the solution of these problems. They would also offer, at the request of member states, training in the techniques of educational television for personnel in charge of the application of technology to education.

The absence of sufficient knowledge in any one country and the absence of sufficient trained manpower in virtually all countries suggests that these entities cannot easily be created in each country. Establishment of regional multi-national centers, along the lines proposed by an OAS group of experts on educational technology, appears to be a very attractive approach to coping with these problems.*/

Accordingly, the multi-national training center recommended by the OAS group of experts should be given encouragement and support to implement a program for development of applied technology in education, with particular emphasis upon the use of educational technology including television as an effective instrument in helping to meet Latin America's educational needs.

Moreover, appropriate agencies should be alert to the possibility of encouraging the development of additional regional multi-national centers in those areas where the environment is favorable for success.

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*/ Organization of American States, Final Report, Fifth Meeting, Inter-American Cultural Council, February 1968.

B. Assistance to Individual Country Programs

As an essential immediate step, the United States should take the lead in encouraging and supporting the use of television for educational purposes, on a scale large enough to demonstrate the technology's capacity to deal with problems of substantial scope and consequence. It is important to include a major experiment in its use for village development, in addition to formal education. These should be frankly recognized as research and development efforts, with their worldwide significance placing them in a category meriting long-term and substantial support. In this context we applaud the pilot program to be undertaken by NASA and the Government of India to explore the use of satellites through actual experiments for educational television in the early 1970's.

C. A U.S. Institute for Educational Planning and Technology

In support of both the regional centers, and the individual country efforts described above, the United States should further develop its own competence in the application of educational technology. To achieve this, strong consideration should be devoted to establishing a U.S. supported institute or center capable of performing the following functions:

1. Performing basic research in the most effective ways to increase the educational efficiency of telecommunications media.

2. Performing multi-disciplinary applied research in the applications of educational technology to meet the needs of less developed countries under the prevailing social and environmental conditions.

3. Offering educational training for qualified persons who wish to develop competence in the field of telecommunications related to educational, cultural, and socio-economic development.

4. Offering training for individuals planning to work in a foreign country where a knowledge of the resources of telecommunications would enhance their effectiveness -- for example, training for those in agriculture, public health, job training, or other areas where the dissemination of information to large numbers is involved.

5. Offering training to foreign nationals in the techniques of planning and utilizing educational technology, especially those who do not have the resources of national or regional training centers.

6. Building and maintaining working associations with professional experts of other countries and international agencies.*/

D. Development of Low-Cost, Low-Maintenance Television Receivers

As mentioned earlier, one of the greatest problems of extending television into remote areas is the difficulty of maintaining and operating television receivers. Unfortunately, the receivers available to date were designed for ordinary household use by viewers accustomed to electronic gadgetry. Large-scale exploitation of the new technology in the environments of less developed countries will require that the technical support requirements for television receivers be drastically reduced. Accordingly, we recommend that the U.S. Government, in cooperation with private industry, explore the feasibility of developing a low-cost, low-maintenance receiver (perhaps with only a 1 or 2 channel tuning capability) suitable for use with batteries or other sources in remote regions that do not have electricity. Ideally, the receivers would be produced by the using countries themselves.

According to our studies, the total cost of any large system is likely to be dominated by the investment and operating cost of the receivers themselves. Therefore, any effort that substantially reduces the cost of the receivers will have a major impact on economic feasibility.

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*/ In making these recommendations, we note that The Commission on Instructional Technology, under contract with the U.S. Office of Education, is currently exploring promising applications of new technology that may have great relevance to less developed nations as well as to the U.S.

E. Cooperative Planning in Expanded Use of Satellites

Clearly, much of the planning and organization of educational television use can precede the use of satellites or other long distance electronics telecommunications media. The earliest programs will, in any event, probably operate with existing television broadcasting stations in large urban areas operating from video tape libraries. However, as the systems expand, long distance electronic transmission either by satellite or other means will become increasingly vital in providing both instantaneous (real-time) distribution and two-way communications links. Instantaneous distribution will be important:

-- As systems expand into the hinterlands alternate video tape distribution systems will become increasingly costly and unwieldy;

-- It will permit program schedules and content to be changed on short notice to take into account the myriad problems that will undoubtedly arise in day-in, day-out operation of the ETV system;

-- Major news and timely public affairs programming can be brought into the classroom on an ad hoc basis.

The two-way communications links are important:

-- In permitting use of feedback systems for television programs beamed to small scattered audiences, as for teacher training; and

-- In permitting service needs of schools to be met more promptly.

Quite apart from educational television, satellites are attractive for providing domestic and international telecommunications links as a major contribution to the infrastructure required for economic development. While we have discussed this role largely in the specific context of South America, it is no less important in other areas of the world.

Of course, it is up to the particular countries to determine their own needs and requirements in the areas both of educational television and of two-way communications links. The principal aim of this Chapter has been to delineate, in very general terms, some of the potentially attractive applications. We recommend that these countries be encouraged to explore further and much more concretely the potential use of satellites. Given the importance of domestic services as a complement to global coverage, and given INTELSAT's expertise and experience in the field, we recommend that nations look to it for appropriate assistance in the development and maintenance of these services.

CHAPTER FIVE

DOMESTIC APPLICATIONS OF COMMUNICATION SATELLITE TECHNOLOGY

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CHAPTER FIVE

DOMESTIC APPLICATIONS OF COMMUNICATION SATELLITE TECHNOLOGY

INTRODUCTION

The promise of communication satellites in an operational setting has already been demonstrated by INTELSAT, the international telecommunications satellite consortium representing 63 nations, in which Comsat participates on behalf of the United States. INTELSAT has successfully established satellites over the Atlantic and Pacific. These satellites provide long-haul, point-to-point transmission routes for various services, including telephony, telegraphy, data and television.

Although we have not yet used satellites to provide commercial services within the United States (except for traffic between the continental United States and Hawaii) much discussion has centered on the potential domestic applications of satellite technology. Concrete proposals to use satellites in serving the vast U.S. domestic market have been made in the course of a pending Federal Communications Commission inquiry. Four parties have advanced detailed proposals for operational domestic satellite systems. The American Broadcasting Companies, Inc. and the Ford Foundation have proposed special purpose systems for the distribution of television programs. Under the Foundation's proposal, anticipated cost savings made possible by satellite technology would be used to subsidize noncommercial television programming. AT&T and Comsat, on the other hand, have urged the FCC to authorize proposals for general purpose satellite systems. During the proceeding, Comsat and the Foundation each supplemented their original proposal by suggesting pilot rather than full-scale operational domestic systems. Many others have made their views known to the FCC -- including common carrier, broadcast, computer, aviation, press, government and educational interests. Wide disagreement on a broad range of legal, technical, economic and other issues has emerged.

The President expressly requested the Task Force to examine how soon a domestic satellite system would be economically feasible, whether it should be general purpose or specialized, and whether there should be more than one system.

The Task Force has concluded that communication satellites hold sufficient promise for domestic applications in the coming years to warrant a prompt start in that direction. A number of unresolved questions, however, make it premature to establish full-scale domestic satellite operations at this time or to predict when such a full-scale system would be warranted. We recommend as the most prudent course a modest operational pilot domestic satellite program, with Comsat playing the leading role, as a logical first step.

I. SATELLITES MAY PLAY A SIGNIFICANT ROLE IN MEETING OUR DOMESTIC COMMUNICATIONS REQUIREMENTS

A. Technological Developments Portend Potentially Attractive Domestic Applications

In the early 1960's the promise of commercial communications satellites seemed to be limited primarily to intercontinental use as an alternative to undersea cable and high frequency radio and for interconnecting large numbers of countries. The pace of technological change has, however, been much more rapid than most observers foresaw at that time. The successful launch of a satellite (SYNCOM II) into synchronous geo-stationary orbit in 1963 marked the beginning of a new era. Subsequently, synchronous satellite technology has evolved rapidly, with corresponding reduction in the cost per unit of traffic handled. Continued technological advances such as multiple, narrow-bea antennas, more powerful satellites, and improved multiple-access capabilities are now on the horizon. The trends in technology and cost indicate that communication satellites can and probably will play a significant role in providing a variety of domestic communication services, and in enhancing the capability of our existing networks to meet constantly expanding needs.

In comparisons with terrestrial systems, it is important to bear in mind two inherent characteristics of communication satellites which have no exact terrestrial equivalent. The first is the ability of a satellite to deliver the same wideband message (such as television) to many distant locations simultaneously. By "broadcasting" every message it receives over a wide geographic area, the satellite provides multi-point distribution services via a single relay point. By contrast, a complex network of interconnected trunk routes is required to provide this service terrestrially.

The second unique characteristic of satellite systems is their ability to reallocate communications capacity flexibly and rapidly among a number of individual routes -- in other words, to provide variable capacity routes. By contrast, terrestrial facilities provide fixed capacity routes. Thus, in order to accommodate the variations in traffic loading which are inherent in any multiple user communications service, a satellite system need only reallocate its capacity appropriately among its various routes; a terrestrial network, on the other hand, must employ alternate routing to reallocate its incoming traffic among various fixed capacity routes, through extensive switching and interconnection facilities.

This latter feature of communications satellites has not yet been operationally implemented and precise cost comparisons are impossible to develop. When fully exploited, it will permit a single satellite and its associated earth terminals to provide the equivalent of a complete -- though limited capacity -- terrestrial long-haul network, including both transmission and switching functions. Such a system might well prove economically and operationally attractive for establishing a variety of specialized communications "networks," such as multiple-access, variable information rate data exchange service, computer-aided educational services, and occasional, specialized video "networks."

In addition to television distribution, uses of communication satellites in the foreseeable future might thus include: (a) relay of bulk communications such as multichannel voice/record trunks, high speed data, and video programs among a limited number of points; (b) networking of specialized communications such as voice, data, and graphics among dispersed or mobile users, such as aircraft, ships, computer and information centers; and (c) various scientific and meteorological data collection, distribution and exchange services. Satellites might, therefore, open new horizons in the dissemination and exchange of economic, medical, scientific and educational information among businessmen, doctors, students, teachers and others, and lend added impetus to progress in many areas.

This is not to suggest that communication satellites will revolutionize the present fabric of our already highly developed terrestrial common-carrier network or pose a serious threat to that system. Instead, we anticipate that domestic satellites will complement existing and improved terrestrial facilities, providing such specialized services and overlaid "networks" as their unique capabilities render economically attractive.

B. It is Economically Feasible with Today's Technology to Provide Some Domestic Services by Satellite

Even with today's technology it would be feasible to establish a full-scale operational satellite system providing television program distribution and long distance relay of bulk telephone and record traffic. Precise comparisons between satellites and equivalent terrestrial facilities are difficult because of their differing operating modes, uncertainties about satellite and earth station designs and costs, and difficulties in projecting demand for new services. But our staff studies indicate that satellites would be competitive with terrestrial facilities in meeting some domestic communications requirements.

Television program distribution appears the most economical early use of domestic satellites, principally because satellites can reach many points within a large geographic area simultaneously through a single transmission facility. For two-way high density routes, on the other hand, substitution of satellite for terrestrial facilities under existing technology is less promising. While little switching is required for one-way services, the switching and terminal equipment required for two-way trunk routes accounts for the major part of total cost regardless of whether satellite or terrestrial transmission facilities are employed.

This does not argue that a domestic satellite system even today be exclusively dedicated to television program distribution. If capacity can be added to a dedicated system at lower cost than could be provided through a wholly separate system, the provision of other one-way services or of bulk two-way services (such as telephone trunking) may become economically attractive. In addition, services making use of the excess satellite capacity that would otherwise exist during off-peak hours of use might add significantly to the overall viability of the system. Moreover, the suitability of satellites domestically for two-way services should be tested in an operational setting.

II. A NUMBER OF UNRESOLVED QUESTIONS MAKE IT PREMATURE TO ESTABLISH FULL-SCALE DOMESTIC SATELLITE OPERATIONS AT THIS TIME

A. The Industry Structure for Using Satellites to Meet Domestic Communications Requirements Could Evolve in Various Directions

Domestic satellite ownership and operations could evolve in quite different directions. Under one approach, they would be placed substantially under common carrier control. For example, Comsat's operations could be limited to the international arena, with AT&T or the terrestrial common carriers jointly given a monopoly of the space segment and ground environment of any domestic satellite system.

A variant would be to give Comsat or a new domestic satellite entity a monopoly of the space segment with authority to deal only with the terrestrial carriers, as is the general rule today in the international industry. Alternatively, direct dealing with other users might be permitted.

Another alternative would permit entry into the domestic satellite communications field by other entities in addition to the existing carriers. This would be similar to the view taken by the FCC in the "Above 890" decision, where it authorized private terrestrial microwave systems. For example, broadcasters or other entities desiring to provide supplementary services might be authorized to establish satellite systems subject to appropriate regulatory ground rules.

Still another approach would be to retain for public or quasi-public ownership, on a permanent basis, the space segment alone of any domestic satellite system. Carriers and private entities would be authorized to construct and operate earth stations working with the satellites. They would obtain basic transmission capacity from the satellite operator.

B. The Appropriate Use of the Electromagnetic Spectrum by Domestic Satellite Systems Has Not Been Adequately Resolved

At the present time, commercial satellite communications systems must share the 4 and 6 GHz frequency allocations with terrestrial microwave relay systems, but substantial disagreement has been voiced about whether this shared use of common frequency bands is possible on a widespread basis without harmful interference. Divergence of opinion exists about the number of satellites that could operate simultaneously on the same frequencies in the orbital sector suitable for U.S. domestic communications purposes. There is also uncertainty about the feasibility of providing satellite services in new spectrum areas above 10 GHz which are not presently authorized for use by satellites; the necessary equipment has not been developed, and there are unresolved questions about the impact of increased energy losses due to atmospheric effects at such high frequencies. Moreover, proposals have been made before the FCC to use portions of the spectrum above 10 GHz for certain terrestrial services.

In short, we do not know whether problems of spectrum use will restrict the feasibility of full-scale domestic communication satellite operations, or whether they will have a major bearing on the desirability of free entry into the domestic communication satellite field.

It is notable that an ITU World Administrative Radio Conference for Space Telecommunications (WARC-ST) is to be held in late 1970 or early 1971. Given the estimated two-year lead time required to establish a domestic satellite system after it is authorized, we believe it unlikely that any useful data will be developed under a domestic pilot program by the time the WARC-ST convenes. We do believe, however, that whatever proposals are submitted by the

United States concerning frequency allocations above 10 GHz must be very carefully drafted so as not to limit the flexibility of the anticipated experimental or operational aspects of our domestic program.

To resolve these issues we need both experimental data on factors such as interference mechanisms for operations below 10 GHz and propagation conditions above 10 GHz, and analysis of a variety of possible approaches to employing these higher frequencies. In a field where the vagaries of radio propagation are subject to a variety of interpretations, there seems little prospect that these complex technical issues will be fully resolved in the absence of more operating experience.

C. Available Data Are Insufficient to Determine the Comparative Advantages of General Purpose vs. Specialized Systems

Substantial disagreement also exists as to the comparative advantages of a general purpose domestic satellite system and one or more systems "dedicated" to specialized uses, such as radio and television program distribution. Advocates of a "dedicated" system for program distribution have contended that such a system would provide better efficiency and economy for specialized television interests than would a common-carrier system having widespread and potentially conflicting responsibilities to several industries. They maintain that the added complexity of a general purpose system -- in space and on the ground -- would not confer appreciable benefits from cost-sharing for broadcast applications, but would instead compromise the economic advantages of a "dedicated" system.

The general purpose approach, supported by Comsat and the other common carriers, has been defended on various grounds. They claim that (a) a general purpose system would use the frequency spectrum more efficiently, and that it would offer substantial economies of scale; (b) economies would flow from the possibility of avoiding duplication of launch vehicles, satellite research and development, procurement, earth station facilities, tracking, telemetry and command facilities, and common operation and management; (c) further cost reductions would flow from reduced requirements for satellite spares and other back-up facilities; (d) the multi-purpose system would have greater flexibility, especially in orchestrating the highs and lows in traffic demand for individual services;

and (e) introduction of new satellite services would be facilitated.

However, a middle ground may exist: essentially separate systems (e.g., one for wideband service, another for general purpose services) could conceivably be operated within a framework that permits substantial sharing of common facilities and costs.

Finally, if the regulatory framework were to evolve along the lines to be described in Chapter Six of this report, we might rely more on the play of market forces to determine these questions, as we do in other areas of the economy where new techniques are applied -- subject, of course, to appropriate governmental regulation.

D. The Potential Benefits of Satellites in a Domestic Setting Are Not Now Sufficiently Comprehended to Determine How They Might Best Be Shared in the Public Interest

However a domestic satellite system is structured, the manner in which any cost savings made possible by the new technology are shared is an open question.

If it were operated as an integral part of the common carrier network, the benefits could be passed on to the public through general reductions in the carrier's rates, reflecting the reduced cost of providing services by terrestrial facilities as well as by satellite. Alternatively, the benefits could be channeled exclusively to the user of the satellite service, as would be the case with a specialized satellite system. Or, if both common-carrier and non-common-carrier systems are authorized, competitive market forces might play a large role.

Another aspect of this question concerns the desirability of subsidizing certain non-commercial interests through operation of a domestic satellite system providing commercial services. For example, public or educational broadcasting stations might be offered free satellite channels, as contemplated in various of the domestic satellite proposals submitted to the FCC. The Ford Foundation has gone further and proposed that financial support for non-commercial programming be provided out of the savings from the operation of a domestic television satellite system, enabling the nation to earn, in effect, a "people's dividend" from its enormous investment in space.

While it is essential to have a sound financial basis for public broadcasting, the concept of a "people's dividend" from satellite communications poses problems. For example, we do not yet know whether any domestic satellite program would in reality generate sufficient savings to permit an appreciable subsidy for non-commercial programming. Moreover, provision of television distribution by domestic satellites will require that the satellite services are priced attractively to commercial broadcasters, who may be reluctant to use satellite facilities if most of the economic incentives were removed.

We feel it is sufficient to conclude now that the wiser course is a policy which is neutral between the satellite and terrestrial technology and allows the natural advantages of each to be sought, developed and put into service. If commercial broadcasting operations are to support non-commercial programming, it would seem preferable, therefore, to devise a method that does not depend upon the mode of distribution involved. In any event, we cannot say whether a "people's dividend" will prove feasible until experience is gained with a domestic satellite program.

E. Any Decision on Domestic Satellites Must Be Consistent With Our International Commitments

The relationship between domestic satellites and the global satellite system is of great significance. We must consider how an appropriate institutional framework for domestic communication satellites could be related to INTELSAT under the present interim arrangements. And looking ahead, we must fashion flexible machinery for relating domestic and other satellite systems to the global system under the definitive arrangements to be negotiated in 1969.

We should not take any action domestically that would have an unsettling effect on the forthcoming INTELSAT negotiations. The question of entry into the domestic satellite field, and many other questions, cannot be divorced from consideration of INTELSAT policies that remain to be worked out in these negotiations.

III. A PILOT DOMESTIC SATELLITE PROGRAM SHOULD BE ESTABLISHED

In light of the various unresolved issues discussed above, we consider it premature to fix domestic satellites into a particular institutional and operational pattern. There is not yet sufficient understanding of the potential role of satellites domestically to warrant approval of a full-scale domestic satellite system or systems; to do so might well create an irreversible pattern and foreclose valuable options.

Merely to tread water is, however, also undesirable. Most interested parties see promise in the use of communication satellites for domestic services, although they differ on various specific issues. The interest of private parties in investing in a domestic satellite system may not be necessarily or wholly congruent with the public interest, but it cannot be discounted. And while our own independent estimates do not indicate that substantial economies will result in the very near term from the substitution of satellite facilities for a terrestrial equivalent, neither do they show that some uses of domestic satellites -- particularly for television distribution -- are bound to be uneconomical. Inaction would ignore opportunities for cooperating with INTELSAT and would forego the benefits of the insights that potential users and operators, as well as policy makers, might gain from a pilot program. Nor should we ignore opportunities to gain experience that can be shared with other nations, particularly those with underdeveloped terrestrial systems for whom satellites may have very significant potential.

Accordingly, we conclude that a pilot program, frankly tentative and limited in scope, should be established. It would offer a number of concrete benefits:

It would provide valuable technical, economic and operational data for guiding timely future decisions regarding domestic applications of communication satellite technology. The data which would be marshaled would provide a much clearer perspective on

-- use of the frequency spectrum;

-- satellite system costs;

-- the integration of satellite and terrestrial facilities;

-- the optimal use of satellites for television distribution including educational and instructional uses;

-- the feasibility of satellite networking for specialized services and the shared use of satellite facilities;

-- the interests of users.

Such a start, using appropriate advanced technology, should have a stimulating effect on communication satellite research and development especially in areas of particular interest for specialized applications, such as directivity and pointing accuracy of satellite antennas, multiple-beam techniques, and multiple-access techniques.

A pilot program, even though modest in scope, would provide facilities for significant commercial operations. For example, Comsat has proposed use of two satellites in synchronous orbit, each having a five-year life and capacity of up to twelve color television channels or 21,600 voice channels. Television, voice, data, telegraph, etc., could be transmitted simultaneously. Our own studies indicate that a single satellite with multiple-beam capability might provide up to 24 color television channels or 43,200 voice channels, divided among the four U.S. time zones, at little increase in satellite cost.

The program could also support non-commercial broadcasting and various other public interest projects. For example, in its proposal Comsat offered to participate in experiments, conducted under government auspices, concerning the practicality and economic advantage of using communication satellites to interconnect educational television and radio stations.

Though only a modest beginning, a pilot program would afford an opportunity to explore the possible arrangements for fitting satellites into the present regulatory and institutional structure of our domestic communications industry. By encouraging broad use and possible participation by carriers and other users, the program should have a stimulating effect on the industry.

Finally, the United States would take a constructive step in furthering international cooperation by establishing a domestic pilot program consistent with the objectives of the 1964 INTELSAT intergovernmental agreement, through an understanding with INTELSAT, and by appropriately relating the domestic program to the global system.

We do not mean to suggest that such a modest program will of itself provide sufficient data to justify a permanent commitment at the end of the pilot to one particular technical or institutional mode. Systemic flexibility should be a continuing underlying philosophy of industry regulation. But we do believe that far more enlightened choices will be possible a few years hence, after experience with the pilot is in hand. Authorization at that time of full-scale domestic satellite operations should raise fewer difficulties than any full-scale domestic satellite system or systems authorized today. And authorization of the pilot need not preclude possible authorization of other systems in the interim, provided, of course, the technical uncertainties discussed earlier are adequately resolved, and that such action does not adversely affect the economic integrity of the pilot.

IV. THE PROGRAM SHOULD HAVE THE FOLLOWING ESSENTIAL FEATURES

A. It Should Employ Appropriate Advanced Technology to Obtain Needed Technical and Operational Data

Satellite technology is developing at a rapid pace. A pilot program that failed to exploit advanced technology already available may not provide technical and operational data needed for making judgments about how to proceed at the end of the pilot program. The facilities employed in such a pilot would also be less attractive for continued use in any subsequently authorized system. Accordingly, authorization of the pilot should be conditioned on a requirement that the parties employ appropriate advanced technology, and that they devote reasonable time and expense to procuring technical data and conducting the experiments necessary or useful for reaching future decisions regarding a full-scale domestic system or systems. The pilot should not, on the other hand, be burdened with unnecessary features that would cause undue delay or destroy its attractiveness to private investors.

We believe that the pilot can yield valuable technical, operational and economic data covering a range of possible systems, and at the same time be operated on a sound commercial basis. While we envision a pilot program that is principally operational, rather than experimental, we do not anticipate that any of the technical features we recommend would involve expenses that could not either be fairly imposed on those authorized to participate in the program (who, presumably, would reflect such expenses in their rates to users) or that the participants would be unwilling to undertake.

1. Multi-purpose design. The principal area where substantial cost savings may be likely in the near future from a domestic satellite system is television program distribution. Moreover, a dedicated, non-common-carrier system could provide an added dimension to the present ownership and operational framework of our domestic communications industry in the area of television program distribution.

But since a multi-purpose pilot program would not involve substantially greater cost than one designed basically for program distribution, it seems to us unwise to forego the opportunity for experimenting with satellites for a variety of domestic communication services. Moreover, a properly structured, multi-purpose pilot program would ensure that cost savings which the program makes possible in particular services are appropriately reflected in the rates charged for such services.

While the pilot program would in effect be general purpose, it should be structured to test, to the extent feasible, the advantages of a system dedicated to television distribution and other specialized wideband services. This requires employment of earth stations of appropriate sizes and performance criteria for the range of such services possible, the testing of various operational approaches, and the maintenance of accounting procedures designed to segregate costs so as to facilitate subsequent determinations regarding the feasibility of a general purpose and specialized system or systems.

Broadcast, special purpose, and general purpose operations should be conducted independently within the framework of a single pilot program, and they should share common satellite facilities. Each may need a basic share of total capacity; however, in the interests of economies of overall pilot operations, flexibility is preferable to a rigid division of channels for the full-time exclusive use of either system, or for particular classes of users. At the outset, general purpose operations may be very small, while many of the needs of broadcasters, both commercial and non-commercial, may dictate only part-time channel requirements, which should permit effective sharing of channels. Indeed, new network and program sources might be discouraged if required to pay for full-time channels when interconnection is needed for only brief periods during the day.

2. Interference measurements and sharing criteria. Data on potential interference between domestic satellite and microwave relay facilities should be obtained. To this end, receive-only earth stations should be established in both urban and non-urban areas so that interference from terrestrial microwave facilities can be monitored. Transportable ground station equipment should be deployed in metropolitan areas congested with terrestrial microwave

facilities to test the severity of mutual interference and ways of avoiding such interference.

We cannot overemphasize the importance of prompt action to develop and improve criteria for frequency sharing by communication satellite systems and terrestrial communication systems. The pilot program will provide some useful data in these respects. But, independently of the pilot, there is a need for prompt efforts by Government and industry so that sufficient data will be available to help guide the pilot program and to make sound judgments about the potential problems that might be presented by shared use of common frequency bands on a widespread basis. No less important, the data is needed to deal with any such problems, should they arise.

3. Channel multiplication by spectrum reuse. The use of narrow antenna beams from the satellite, each covering separate geographical areas and providing some reuse of the available frequency assignments, has considerable promise as a means of increasing the channel capacity of an individual satellite and of the orbital space as a whole, thereby reducing the overall cost per channel of satellite services and achieving greater communications capacity from

the frequency spectrum. The development and operational demonstration of such a multiple-beam, spectrum reuse capability may be the most significant technical and economic feature which could be incorporated in the pilot program. Such a capability, if feasible, would be highly desirable. Its inclusion should, therefore, be explored carefully and insisted upon, if feasible. In assessing both the merit and feasibility of such an approach, the continuing advice of NASA should be sought.

4. Service to non-contiguous areas. Multiple antenna beams also offer the possibility of serving non-contiguous areas such as Hawaii, Alaska, Puerto Rico and the Virgin Islands from domestic satellites. The feasibility of serving these areas with such a configuration should be thoroughly examined prior to and during the pilot program to determine whether any of these areas could be served economically either by the pilot or by any subsequent full-scale system which might be developed. The feasibility of serving these areas by domestic satellites and by INTELSAT facilities would have to be compared. Whatever the decisions ultimately reached, we should take no action that conflicts with our commitments to the global system.

B. Broad Participation in the Pilot Program is Desirable */

In addition to a carefully developed and detailed technical and experimental plan, a pilot program would have three basic components:

-- the space segment -- satellites and associated facilities;

-- fixed send/receive earth stations, both large and small;

-- special purpose earth stations, including receive-only stations and portable facilities.

The first two components are essential both to the provision of a variety of two-way communications services and to the distribution of broadcast programs. The special purpose stations would be designed to provide broadcasting and other specialized services; this category includes portable facilities that would be useful in evaluating the feasibility of by-passing the extensive switched terrestrial network for broadcast program origination, regional networking and similar activities, and for serving a variety of demonstrational and experimental purposes.

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*/ Dr. Welsh (NASC) does not concur in this conclusion as regards the pilot program or a permanent program to follow it. Based on what he considers the unfortunate experience we have had with divided ownership of earth stations in the international field, he would prefer that Comsat own and operate all of the facilities of the domestic satellite system.

Ideally, the pilot program should be controlled by a completely neutral and disinterested entity, lest the pattern of ownership of any fully operational system harden prematurely. The Ford Foundation has suggested that NASA is such an entity but there are practical obstacles to NASA's undertaking the pilot project. While NASA could technically provide the space segment, we doubt that it would be the appropriate entity to test the commercial and operational feasibility of domestic satellite services, and in any case it would need Congressional authority to do so. Seeking new legislation could cause considerable delay in starting a program for domestic use of satellites, and it is questionable whether Congress should be asked to appropriate public funds for a project when private interests are apparently willing and able to commit the necessary resources.

Nor does it seem desirable to create a new private corporation to own and operate the pilot program. Creation of such an entity could be a time-consuming process entailing very substantial delay in the initiation of the pilot, and premature in the absence of a better understanding of the role of satellites domestically. It would also prejudice future arrangements.

We think it important that a pilot program be designed to ensure that no participant obtains a preemptive position. Since there is little doubt that the pilot project will in fact have a shaping influence on the future regulatory pattern of the domestic satellite industry, the project should be designed to meet this concern. Several steps seem warranted.

First, the Commission should, in announcing approval of the pilot project, make clear that all ownership arrangements authorized for the pilot are strictly provisional and subject to subsequent modification. It should also stress that the extension of the authorized-user rationale to the domestic arena should be a matter for fresh consideration.

The Commission should also insist that the pilot project be so structured that subsequent modification of the ownership arrangements would not cause undue hardship to the parties involved. Otherwise, divestiture or some other substantial alteration of the proposed arrangements might not be practical. Specific provision should thus be made to allow the participants in the pilot program to recover any investment they had made with a reasonable return on that investment. This is not to say the participants would be protected against risk of loss should the pilot project be a commercial failure. That risk they are apparently willing to assume, provided realistic traffic commitments are forthcoming from the principal users of the system. But if the venture leads to a further stage of development, the participants should be assured against loss in the event that their interest in the pilot program were transferred to other entities.

Finally, ownership arrangements for the pilot should be designed, so far as is feasible, to permit the exploration of various ownership patterns among different interests and, in particular, of the right of users to participate independently of the carriers.

We recognize that the simplest solution would be to authorize Comsat to establish all the facilities used in a pilot program. Systemic integrity would be thereby enhanced and undue delay avoided. While sympathetic to these considerations, they may well be outweighed by advantages of broader participation -- provided that strict conditions are laid down by the FCC, as proposed below.

C. Comsat Should Have Primary Responsibility

1. The space segment should be owned by Comsat as trustee. Divided control of the space segment would be administratively cumbersome, and could affect operational efficiency. Comsat is well qualified to establish and maintain the space segment as trustee. By trusteeship, we mean an interim ownership basis with no commitment by the government as to ultimate disposition of the franchise to operate any part of a domestic satellite system. Moreover, the principal benefits possibly flowing from divided ownership of the space segment -- experimentation with the feasibility and the advantages of a specialized broadcast-only system, preservation of flexibility in the ownership arrangements for the pilot, and ensuring a pricing system closely related to the costs of particular services -- need not be lost by entrusting the whole space segment to Comsat. To meet these objectives,Comsat should be required to offer satellite channels directly to broadcasters and for other specialized services, to keep separate records for each service, and to price each service according to its direct and fairly allocable costs. We stress that the recommendation of exclusive Comsat ownership of the space segment as trustee does

not reflect a judgment that it is entitled to such ownership as a matter of "right," under the 1962 Communications Satellite Act.

While we are not persuaded of the advantages of participation by entities other than Comsat in the space segment through an equity interest, subsequent design proposals should receive appropriate consideration by the Commission.

2. Comsat, the terrestrial common carriers and prospective users of wideband services should be eligible to invest as trustees in the ground environment. We think it unnecessary to lay down a specific pattern of earth terminal ownership. We recommend that the FCC, in an initial statement of policy regarding a pilot program, outline the conditions and procedures for development of a system plan under which formal applications for construction of particular facilities would be entertained.

With regard to specific investment in facilities, the FCC might, for example, invite Comsat and the terrestrial common carriers to file applications for shared ownership of the principal send/receive stations, again as trustees, with Comsat acting as manager of each station under effective decision-making procedures. Since these stations would be used for broadcast operations as well as for the provision of other services, procedures should be established to ensure that the charges for particular services reflect, insofar as possible, only their direct and fairly allocable costs.

Comsat and prospective users of wideband services (e.g., commercial broadcasters, non-commercial and instructional television interests and other public service interests) might be permitted to file applications for the special purpose earth stations, also acting as trustees.

3. Comsat should be program manager of the pilot. With ownership and operational responsibility divided along the foregoing or similar lines, there would be need for central direction and coordination of the program to ensure technical and operational compatibility and fulfillment of the program's objectives. The role of overall Program Manager should be entrusted to Comsat, together with assurances of the requisite authority to satisfactorily discharge its responsibilities. To expedite the resolution of any disputes not otherwise reconciled, the Commission should establish its own special procedures for overseeing

the pilot program. If need be, the ownership or managerial structure could be modified at a later stage of the pilot program.

D. The Pilot Satellite Should Offer Free Satellite Channels for Non-Commercial and Instructional Television

As noted earlier, the pilot or demonstration proposals pending before the FCC contemplate providing free satellite capacity for program distribution to public or educational broadcasting stations. We favor such a provision as a salutary support for these services, in keeping with the action contemplated by Congress in the Public Broadcasting Act of 1967.*/

E. An Advisory Committee Should be Created to Protect the Interests of All Users

While we have recommended a pilot program which avoids unduly complicated and cumbersome ownership, operational and managerial arrangements, the many diverse interests that have participated in the FCC proceedings can and should be protected. Specifically, we recommend that the Commission constitute an Advisory Committee.

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*/ Under the same authority, AT&T and the Corporation for Public Broadcasting recently concluded arrangements for some reduced rate terrestrial networking for non-commercial broadcasting.

The Advisory Committee, in which all interested parties could be represented, would be an appropriate forum for consultations with the entities designated to participate in the actual operations of the program as well as the Commission and Executive Branch.

The Advisory Committee might be a particularly useful forum for non-commercial and instructional users. The satellite capacity made available to them could be utilized for various public interest projects and experiments. For example, the National Library of Medicine has proposed a Biomedical Communications Network to provide improved information and education to the medical community, with satellites used on an experimental basis for interconnection within the network. This and other proposals could be explored in the Advisory Committee during the course of the pilot program.

F. The Pilot Program Should be Consistent with U.S. International Commitments and Appropriately Related to INTELSAT

Neither the United States nor other countries are likely to surrender vital sovereignty over domestic communications. But the international community has a legitimate interest in the use of satellites for domestic purposes. The United States must, for instance, adhere to the rules and regulations of the International Telecommunication Union in its use of the radio spectrum, and to the commitments we have made to INTELSAT for a global satellite system. Thus, domestic satellites should be consistent with INTELSAT's proposed use of the frequency spectrum and orbital space, and should cause no harmful interference with the global system.

While at first glance it might appear desirable to establish the pilot satellites under the same rules governing the satellites established as regular increments to the INTELSAT space segment, such an approach could create severe economic distortions, unduly enlarge the role of the United States in INTELSAT, and create troublesome domestic legal and policy problems. It does not follow, however, that we should proceed wholly outside of INTELSAT. Such a course might only encourage centrifugal tendencies in INTELSAT. In view of the U.S. role in and commitment to the global system, we should proceed circumspectly in establishing a domestic program. While the dangers of proliferation of satellite systems are not immediately pressing, it would be shortsighted to ignore opportunities for cooperation with INTELSAT in ways that could strengthen the global system.

We recommend, therefore, that the pilot program be established on the basis of an understanding reached with INTELSAT. By establishing appropriate relationships with INTELSAT in connection with a domestic program, we would affirm the consortium's central role and also encourage other nations to look to INTELSAT for guidance and for help in basic planning. Technical coordination of the pilot program with the global system can thus be enhanced, and possibilities explored for related development of the pilot program and the INTELSAT system in a way that reinforces the strengths of both activities. A principal attraction relates to the possibility of sharing common research and development costs of INTELSAT satellites and the pilot satellites. Other areas of potential mutual benefit should also be explored. These include the shared use of INTELSAT's control and telemetry facilities for the domestic program, shared cost arrangements for launch services, maintenance of common satellite spares and back-up facilities and possibly a joint program for procurement of satellite hardware.

This course would meet legitimate concerns about harmful proliferation of satellite systems, establish the useful precedent that a nation planning a specialized satellite service look first to INTELSAT and work out with the organization an arrangement that fully recognizes and protects the interests of the global system, and demonstrate that INTELSAT has sufficient flexibility to adjust to individual national needs in a manner that does not jeopardize its own future.

G. The 1934 Communications Act and the 1962 Communications Satellite Act, Read Together, Provide the Legal Basis for Authorization of the Pilot Program As Well As for Governmental Regulation and Supervision

Comsat was created by the 1962 Communications Satellite Act. Its powers derive from that Act, and it can function only in accordance with the terms of the Act.

Comsat has adequate legal authority to participate in the pilot. There need be no conflict for the corporation in fulfilling its responsibilities as the United States participant in the global satellite system and its responsibilities as "trustee" in the pilot domestic program.

The Federal Communications Commission has broad regulatory authority under both Acts. Its powers under the 1934 Act are extensive, and apply to such matters as use of particular frequencies, construction of communications facilities, and rates and financial matters. The 1962 Satellite Act provides further guidance for the Commission in its administration of the provisions of the 1934 Act, as amended and as supplemented by the 1962 Act, with respect to satellite communications.

Certain provisions of the 1962 Act have meaning only in the context of the global system -- e.g., Section 201(c)(3), which relates to the establishment of commercial communications to foreign points. However, it would be an unduly restrictive interpretation of the Act to view its provisions regarding governmental regulation and supervision as applicable only to the INTELSAT system. While some of the provisions regarding governmental regulation and supervision might be construed as expressly applicable only to U.S. participation in the satellite system envisaged by the 1962 Act -- that is, the INTELSAT global system -- their logic extends to any commercial communication satellite system in which the U.S. participates. Congress cannot have intended in 1962 to establish a pattern of governmental responsibilities for regulation and supervision of communication satellites that would not have substantial application to domestic satellite systems.

The role of the Executive Branch with respect to communication satellites is broadly conceived and reaches almost every aspect of Comsat's functions under the 1962 Act. This Act, together with the 1934 Act, provides the broad framework for delineating governmental responsibilities with respect to communications satellites and, accordingly, to the pilot program. The President could be expected to exercise, to the extent applicable, his responsibilities under the 1962 Act with respect to satellite communications.

NASA could also be expected to cooperate in connection with the pilot program, as by consultation and advice regarding the technical characteristics of the system and furnishing satellite launching and associated services on request and on a reimbursable basis.

The 1962 Act also ensures accountability to Congress of activities and achievements under the pilot program, since the President, Comsat and the FCC each submit annual reports under the Act.

Although Congress has provided the necessary legislative framework for comprehensive governmental regulation and supervision of the pilot program, it would be useful to issue an Executive Order along the lines of Executive Order 11191, of January 4, 1965, to make explicit the responsibilities of the various agencies of the Executive Branch with respect to the pilot program. And while there is, in our view, no present need for further legislation to govern domestic applications of communications satellite technology, provided a pilot program can be successfully launched, we do not rule out the possibility that such legislation may be desirable at a later stage.

H. Intensive, High-level Executive Branch Attention Should be Given to Monitoring the Pilot Program, with One Organization Designated as the Focus

The theme of this chapter has been that we need more data and experience about domestic use of commercial communications satellites before wise and informed decisions can be made about the structure and framework of any mature domestic satellite industry. The pilot program should be structured to yield the requisite data and experience. But the pilot will fail as our experiment unless the government has and uses the capability to evaluate its results. Data will be obtained in a variety of areas, technical, operational and social, including:

-- cooperative sharing by space and terrestrial services to minimize frequency interference;

-- reuse of the frequency spectrum by narrow-beam antennas;

-- problems of integrating satellite services with terrestrial facilities;

-- user acceptance of satellite services;

-- feasibility of regional networking and bypassing manned television operating centers;

-- installation and annual operating costs of the various components of the satellite system, and cost projections for expanded operations;

-- feasibility of general purpose and specialized systems, or some combination thereof;

-- support of non-commercial operations;

-- value of satellite facilities for educational broadcasting and specialized government users such as HEW.

At the end of the pilot program */ it will be timely to consider the broader issues involved: the future role of domestic satellites, and whether they offer sufficient promise to justify continuation beyond the pilot period; whether domestic satellites should be general purpose or specialized, and whether there should be more than one system; and the ownership and regulatory framework that should govern domestic satellite operations.

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*/ Comsat anticipates that it will take about two years to establish the program, from the date of authorization, assuming no administrative delays. It would be useful to fix a definite time period, calculated from the time the pilot program is established, at the end of which the program would be thoroughly reviewed. While the satellites used in the pilot are expected to have a design lifetime of more than five years, that seems unduly long for a true pilot program. Two to three years should be a reasonable length of time within which to achieve the limited objectives of the pilot.

To assist in evaluating the results of the pilot program and making future decisions in these areas effectively, a continuing Executive Branch role would be highly desirable. This responsibility -- which we conceive to be one of "monitoring" the progress of the pilot program, without derogating from the legal responsibilities of the FCC -- should be vested in an organization designated by the President. By monitoring the progress made under the pilot program, the responsible office would be able to assist the President in making an independent evaluation of the future of domestic applications of satellite technology, and of appropriate institutional arrangements. The office should advise and assist in the structuring of all aspects of the pilot program, gather and assess the data and information acquired during the course of the program, and undertake any independent studies or projects that may be needed to make timely recommendations upon conclusion of the program.

V. THE FCC SHOULD GIVE FAVORABLE CONSIDERATION TO A PILOT DOMESTIC SATELLITE PROGRAM ALONG THE LINES DESCRIBED IN THIS CHAPTER

The program we have outlined should be promptly implemented; a start appears feasible within 1969. We urge the FCC to give it favorable consideration, and recommend that the Commission first issue a statement of general policy outlining the conditions under which formal applications would be entertained.

CHAPTER SIX

THE DOMESTIC TELECOMMUNICATIONS CARRIER INDUSTRY

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CHAPTER SIX

THE DOMESTIC TELECOMMUNICATIONS CARRIER INDUSTRY

I. INTRODUCTION AND SUMMARY

This chapter treats the core of the telecommunications industry -- the traditional services of the domestic common carriers, such as the Bell System, General Telephone and Electronics, Western Union and the some 2,000 independent telephone companies, and related private communications services. Among these services are telephony and telegraphy, the newer offerings such as computer data transmission, and television and radio program transmission from studios or other points of origination to local broadcasting stations.

The President directed the Task Force "to make a comprehensive study of communications policy." He spoke of the need to review past activities in the field of communications, and to formulate a "national communications policy." More specifically, the Task Force was asked to "determine if the Communications Act of 1934 and the Communications Satellite Act of 1962 require revision." In studying the future for satellite communications, both domestic and international, we were directed to study ways in which the new technology should be integrated into a balanced and dynamic communications system. As the President observed, the new technology -- exciting as it is -- does not mean that all our surface communications facilities have become obsolete.

We have found an examination of the domestic industry to be indispensable, both for itself and because of its interaction with other elements of our mandate. And in our study we found juxtaposed two basic facts: On one hand, an impressive record of past achievement in terms of innovation and market growth within the industry; and on the other, an industry in a state of creative ferment facing a host of new challenges and new opportunities.

A. Given the Nature of Public Message Telephone Service, Integrated Control Remains Vital

On the basis of existing technology, we conclude that the basic structural element of domestic telecommunications services -- the integrated provision of public message telephone service -- is satisfactory; and the case for private monopoly regulated by public authority is convincing. The switched network should remain a high quality system interconnecting all terminals reliably and economically.

This conclusion is based on the fact that public message telephone service, employing the switched network, has characteristics that sharply distinguish it from other services. The ordinary user of public message telephone service, as distinguished from the user of private line services, requires access on demand from his telephone to any one of millions of points. Integrated operational control -- obtained through the combined efforts of the Bell System and the franchised independent telephone companies -- is essential in providing this universal access.*/

This conclusion is also based on the weighty consideration of system optimization, system integrity, and service reliability. And it is based too on considerations of national security; for crisis management requires a

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*/ The extent to which such integrated control requires actual ownership or management of a particular element in the system is, of course, related to technological developments and the evolution of regulatory policy. One example is in the area of domestic satellites, where we recommend a pilot project in which Comsat would provide long-haul circuits to terrestrial carriers.

completely reliable capability for communication, both within the nation and with our forces and allies overseas. System optimization involves the coordinated planning requirements of a vast, interdependent network of communications facilities. Since each element affects many others, development of single segments without regard to their effects upon the total system could well lead to wasteful redundancy. System integrity involves the need for control over quality of the inputs to the network. Users or operators of one part of a communications grid can, by supplying it with improper or distorted signals, interfere with other users throughout the system. Finally, high service reliability, which the American public has rightly come to expect, could be jeopardized by developments which weakened the technical integrity or viability of the public message telephone network. Thus, it is important to have coordination for the technical standards in the network, its interconnections, and its inputs.

That integrated control is a sound organizing principle is well-supported by the impressive rate of past technological advance and market growth: The number of telephones in the United States has quadrupled since the end of World War II. In only 15 years, direct distance dialing has been extended to more than 90% of all telephones in the United States. In the past two decades, improved transmission systems have been introduced at the rate of one every two years. Although the overall cost of living has risen by 140% since 1940, total telephone rates (local and interstate) have increased only 10%, while interstate rates taken alone have actually fallen by 20%. In short, it can truly be said that the United States has the finest telephone system in the world.

Fully mindful of this record of achievement, we inquire here into the basic elements of a well-conceived and comprehensive national policy that would contribute to continued rapid advance. For we see a host of potentialities emerging for yet more cost-reducing innovation, for new services, and for market growth in many directions. Policy must be designed to exploit as fully as possible those potentialities, while maintaining the integrity and viability of the public message telephone network which constitutes the core of our national telecommunications system. Only such a policy applied as feasible at every stage, from research to the delivery of private and common carrier services, can over the long run assure our nation an unsurpassed communications basic science, technology and service.

B. The Broad Goal of Public Policy Should be to Release and Encourage Potentialities for Innovation in Technology and in Management, Both Within the Public Message Telephone Network and Outside it, Where Such Changes do not Affect its Basic Integrity and Viability

Telecommunications policy is under the healthy stress of developments occurring in such industries as the computer, electronic and aerospace, as well as those originating within the traditional confines of the telecommunications industry. It is safe to predict that forces within all these industries, harnessed to the enterprise and imagination of many businessmen, will continue to be powerful stimulants to progress in the years ahead. Public policy should promote an environment assuring free and competitive opportunity for such developments without impairing the integrity and viability of the basic telephone network.

Obviously, in many cases changes and modifications can be introduced within the industry without adversely affecting the basic telephone network. Their potential can and should be tapped to improve that network, and to provide services supplementary to those of the system.

As these developments occur, some should be viewed as characteristic of the great mass of American business, unregulated save by the antitrust laws. Others may, in part, come within the purview of the FCC. Still others may be components of the integrated common carrier network falling within the full scope of public utility regulation.

In approaching these problems, we have been guided by the basic premise underlying the law and policy affecting American industry and commerce: that, unless clearly inimical to the public interest, free market competition affords the most reliable incentives for innovation, cost reduction, and efficient resource allocation. Hence, competition should be the rule and monopoly the exception.

And, where monopoly is required, it should be protected from competition to the extent that the public benefits from its natural monopoly characteristics. In that case, the public is protected by regulatory constraints.

These, then, are the twin principles which underlie the recommendations of this chapter: Maintaining the integrity and viability of the basic network as an integrated system on one hand; on the other, releasing and encouraging potentialities for improvement which might otherwise be restrained by tradition, business habits, or regulatory practices no longer appropriate in the face of new challenges and new opportunities.

II. NEW OPPORTUNITIES ARE EMERGING FOR SERVICES SUPPLEMENTING THOSE OF THE PUBLIC MESSAGE TELEPHONE NETWORK

At the outset, we find it useful to distinguish between the public message telephone service, and leased line or private line service. The former uses a portion of the integrated nationwide network with circuit switches to connect on demand any subscriber's telephone to any one of the 100 million telephone stations throughout the country -- or to any one of the other 100 million throughout the rest of the world. The prime characteristic of this market is universality of access to a multitude of occasional users. In contrast, a telephone or telegraph private line is a circuit connecting two or more points to meet the needs of specific users for full-time access to fixed points. While private line service shares much equipment with the message service -- the same cables, microwave towers, repeater terminals, carrier terminals and the like -- it does not ordinarily employ the elaborate circuit switching facilities of the telephone message service.

Another category, public message telegraph service, requires switching, but of a distinctive kind. Only a few thousand Western Union offices need be connected, rather than millions of telephone subscribers; and individual telegraph messages, unlike telephone calls, can be bunched or stored and forwarded after a delay. For these reasons Western Union employs a separate and specially tailored message switching plant, in addition to using channels in the telephone switched network.

In recent years, demand by government and business enterprises has been growing rapidly for private line services providing both voice and record links. Such services can be provided with circuits in paired wire and coaxial cable, terrestrial microwave relay and, prospectively, in satellites. In some cases, these circuits are provided by the common carriers. In others, users employ their own private line systems.

The evolution of these supplementary services offers new opportunities for progress in improving communications services. At the same time, it raises pressing policy questions with regard both to the integrity and the viability of the basic integrated network.

A. Subject to Radio Spectrum Limitations, Liberalized Entry into Inter-City Private Line For-Hire Service Appears Justified

While we conclude that salutary competitive pressures would be introduced by more liberalized entry into private line service, it is for the FCC to determine the merits of specific applications for entry. It is for the FCC to consider the impact of entry in specific cases on the viability of the integrated system. Moreover, a multitude of complex issues confront regulatory bodies in individual proceedings -- issues which are explored in depth on the basis of a record carefully made. Our general comments below should not be taken to imply any view of the merits in specific cases. That, by law, is for the regulatory body.

With the exception of those specialized carriers providing connections to television broadcast and cable systems, the FCC currently permits private line systems outside the existing common carrier network only if they are on a not-for-hire basis. In consequence of this policy, the restrictions on interconnection with common carrier networks, and Bell's low Telpak rates for some users, private systems provide only a small portion of the nation's telecommunications services. While over 400 organizations currently employ private microwave, their total of approximately 2.5 million circuit miles is less than 2% of Bell's total of about 150 million circuit miles.

Private line services, accounting for 15% of Bell's long-haul revenues and 40% of its long-haul circuits, are growing at a faster rate than Bell's other offerings. For Western Union, more than 30% of its revenues represent private line service, some of it in customized computer offerings described in a subsequent section; its private line revenues have increased rapidly in recent years, due chiefly to government use.

We see several advantages to making available more potential business opportunities in these markets. New kinds of services offering a wide range of quality, capacity and price levels might be developed and tested in response to varying needs of particular user groups, thereby enhancing the likelihood of greater consumer satisfaction in these areas. And technological advances, such as microwave equipment produced in competitive equipment markets, might be more rapid if introduced by numerous private line suppliers. Finally, additional competitive pressure, even if confined to supplementary services, could be an important factor in gauging and maintaining high performance in this industry.

In principle, we see no reason for not seeking a similar outcome for satellite and other new long-haul transmission systems when they become operational. Given our lack of operational experience with domestic satellite applications, however, it is too soon to state unequivocally the appropriate disposition. Even so, the burden should continue to be on the carriers to demonstrate why entry privileges should be withheld, rather than vice versa. As we note in our domestic satellite chapter, a number of attractive prospects exist for specialized satellite services (e.g., wide band, wide-area data exchange networks, TV network distribution and occasional-use networking). These might be offered on a competitive basis, in addition to the potential role of satellites in the basic long lines common carrier network.

Application of entry policies to the circumstances of the independent telephone companies may involve different considerations. They have argued that lacking the scale economies of the Bell System long-haul network, they could not respond effectively to competition in private lines without injury to their overall level of service. However, these companies own only a small portion of the total nationwide private line circuits, and the bulk of what they do own involves wholly intrastate lines. Consequently, evaluation of the merits of their position and policy decisions regarding franchises to private line applicants seeking to compete with their private lines is ordinarily and properly for the state regulatory bodies, and beyond the scope of this Report.

1. The issue of service reliability and quality can be resolved in the market place. Of course, the potential benefits from competitive pressures must be weighed together with the effects on the telecommunications system in terms of service reliability and quality, system optimization and an equitable price structure. As a case in point, some have expressed concern that new service competition might offer large users lower costs, but at the price of reduced quality. More generally, they argue that if freer entry were allowed, poorly financed and managed firms may offer service far below what is currently regarded as desirable in terms of quality and reliability. They question whether it is in the public interest to expose potential users to such risks, especially in view of the good service being rendered in this field by existing common carriers.

Subject to qualifications discussed subsequently, we conclude that such questions should be left to the market place. Let the buyer choose among the combinations of price, quality and reliability most appealing to him as a private line user. If the service turns out to be poorer than he expected, he is free to move to an alternative service. Or if the price fails to reflect the poorer performance, perhaps he will choose to remain. This is the essence of the competitive process. One of the great potential benefits of freer entry is to search out and develop new services tailored to particular needs.

Here it is again important to distinguish between the private line customer and the public message telephone user. In the former case, the user is a large business unit competent to choose either to purchase or not to purchase a service between specified points from among the offerings of competing entities. Moreover, so far as quality of private line service is concerned, the choice to go outside the established carriers affects, for the most part, only the customer making the choice. With the public telephone subscribers, the situation is very different. They are less likely than business users of private lines to require the differentiated service that a competitor of the integrated network might provide. And if suppliers did opt to sacrifice quality for a lower price, they might affect not only their own customers but all other customers of the public network who rely on it for dependable and high quality service to every telephone terminal.

2. Proliferation of private communications systems could raise serious problems for the integrated network. But these problems can be met by allowing the established carriers sufficient flexibility in rates to meet competition, and by strengthening regulatory capabilities to prevent destructive competition. If competition is to yield improved efficiency in communications supply, pricing policies must be related to the markets involved. This is likely to require a change in traditional practices of pricing communications services. Today, common carrier tariffs are applied uniformly to jurisdictional areas and based on system-wide costs rather than the specific costs of serving specific routes. If such a pricing policy were to be maintained, new entrants would be provided with artificial and uneconomic incentives

to enter the low-cost high-density routes. By diverting business on these routes from the established carriers -- frequently called "cream skimming" -- the new entrants could deprive the carriers of revenues which partially help to support service on high cost routes. Such patterns could encourage inefficient investment in communications and impose additional costs on society.

Therefore, when a competitive challenge to the established carriers arises, neither they nor the regulatory agencies should continue to apply the principle of jurisdictional tariff uniformity based upon the aggregate costs of serving all routes. Rather, prices over competitive routes should be based upon the costs and demand characteristics of these routes.

The sound response of policy, we believe, is to provide flexible opportunities for entry, matched by a policy of allowing the established carriers sufficient pricing flexibility to respond economically to the challenge of the new services. However, in placing the new entrant and the established carrier on equal terms, the new entrant should be protected against the threat of non-compensatory or "predatory" pricing on the part of a carrier who has a monopoly market. The danger of non-compensatory pricing is real. Under a system of regulation dominated by criteria of fair return on the entire rate base of the carrier, the possibility always exists that the carrier would use its superior position in sheltered markets to cover losses in the competitive sector. What is needed is a minimum price standard calculated with reference to the "long-run incremental costs" for the particular service (including the cost of capital and the profits allowed for the incremental capital associated with the service), rather than for the system as a whole. With such a pricing standard, users of non-competitive services would not subsidize the users with competitive alternatives. The competitive services of the existing carriers would still pay the added costs they impose on the system.

The difficulty of determining an appropriate minimum price standard was illustrated by the Telpak rate case. Prior to the "Above 890" decision, which liberalized entry by private microwave systems, Bell's interstate private line tariff applied uniformly to all consumers. In order to meet the competition of private user systems, Bell introduced discounts ranging up to 85%. Western Union and the suppliers of private microwave equipment complained to the FCC, which was unable to reach a decision in the initial Telpak hearing on the question of whether Telpak rates were compensatory. However, Bell's cost studies undertaken for the current FCC investigation into ratemaking principles indicate that substantial rate increases were necessary in order to make Telpak compensatory.

The problem of defining the limit for the carrier's price flexibility in meeting competition is now one of the subjects of an inquiry before the FCC. If non-compensatory pricing is to be guarded against, the FCC must establish effective regulatory standards over minimum rates. Otherwise, pricing responses of the established carriers could uneconomically foreclose entry of efficient entrants. Given the importance of this issue and its complexity, the FCC should take a more active role on pricing issues than it has taken in the past, including review of subsequent carrier rate increases following competitive responses by carriers.

However, it is also important to recognize that the regulatory power over minimum rates could be exercised in ways which unduly restrict fair competition. Minimum pricing standards must not be employed as "umbrellas" to protect established firms from each other and from potential new competitors. Rather, they must encourage the substance of competition by permitting liberal exit conditions to complement the liberal entry conditions.

We do not minimize the danger that regulated competition could lead to policies of accommodation rather than of real rivalry. The best protection against this risk is a general understanding of the policies involved, and of the principles which should govern in the resolution of disputes. In such an environment, it should be clear to firms considering entry into the field that they would enter at their risk, with no protection against the established carriers should the latter react by reducing their rates towards a prescribed floor.

3. Under new competitive pressures, an equitable pricing structure can be maintained. Some would object to the proposal for geographical rate flexibility on grounds that the rate structure would thereby be badly fragmented. We recognize that the introduction of rate flexibility would very likely force a lowering of rates in some markets and, conceivably, an increase in others.

Some would question whether such adjustments would be widely acceptable and in the public interest.

With respect to private line services we do not consider this a serious problem. Businessmen are accustomed to incurring different costs -- labor, transportation, materials, taxes, etc. -- depending on location. Despite uniform tariffs, differential effective rates have been a familiar feature of the private line business for many years. Businessmen and the communities where they operate should be able to adjust to locational discounts as well.

Problems of differential pricing based on cost differences would be more serious in the public message service. There we have a long tradition of charging equal rates for standard units of service regardless of location; and strong objections might be raised if the pricing of ordinary telephone service were to vary according to the underlying cost characteristics of specific markets.

B. Suppliers of Private Line Services, Both For-Hire and User-Owned, Should Be Permitted to Interconnect With Each Other and With Common Carrier Private Line Networks, Subject to Appropriate Standards Regarding Compatibility and Protection

Restrictions on interconnection with common carrier private line systems have been a serious handicap to the growth of private systems; for such restrictions mean that any user system must be self-contained with its own local loops, terminal gear and other equipment. We conclude that such interconnection could be a stimulus to competition, diversity, and development; that it need not pose a serious threat to system integrity; and that it could be made consistent with the needs of national security.

1. Interconnection with common carrier private lines is vital in promoting competition without wasteful duplication of facilities. Conceivably, an efficient new supplier of transmission facilities could bring lines into individual offices in parallel with those of existing carriers, and still price the service attractively enough to maintain a profitable business. But this outcome, involving obvious and wasteful duplication of facilities, could hardly be judged desirable. While such duplication might be more than offset by efficiencies in operations elsewhere, the most economic solution would be to maintain the efficiencies while avoiding the added cost of the duplication. Thus, policy should be aimed at requiring interconnection with the carriers' private lines, in order that new entrants be able to gain access to their own customers.

2. System integrity need not be jeopardized by such a policy. In the past, the carriers have opposed compulsory interconnection on the ground that their network would be adversely affected by the inputs into it made by a foreign attachment, whether that attachment is a piece of user terminal gear or an entire system. Whatever the relevance

of this concern to the switched network, it is not as critical to connection of private lines; in fact, the carriers already permit private line users to attach their own terminal gear and protective devices and a recent Bell tariff offering would permit not-for-hire private systems to interconnect even into the switched network provided it is done through Bell-supplied protective and network control devices and meets certain criteria.

Another fundamental aspect of system integrity involves management responsibility. The carriers have contended that unless they have full and uncompromised responsibility for service among users, they cannot guarantee high levels of reliability and quality. If ownership of a particular service is fragmented in the hands of several entities interconnected with each other, it is difficult or impossible, some assert, to establish fault and responsibility when problems arise.

Again, the distinction between private line and the switched network is salient. In the former, business users of full-time services are generally knowledgeable buyers. Since the user would be dealing with at most only a few entities serving only the few points to which he is connected by private line, and since we envisage these few entities would have interconnection agreements supervised by the FCC, the problem of divided responsibility should not be of decisive importance.

3. Freer entry should be made consistent with the needs of national security for an integrated nationwide system. The growth of long-haul transmission facilities outside the integrated network poses a question of national security. If these lines are not compatible with the Bell System, they would not be part of the pool of circuits available for alternate routing by the carrier system, and they might not be as useful if a crisis required a change in normal routing patterns.

We agree that the further growth of private systems should be governed by rules taking full account of national security interests. However, the freedom of established carriers to meet the specialized carriers' challenge through flexible price competition, makes it most unlikely that significant portions of our evolving domestic transmission facilities could not be coordinated with the integrated system.

If independent line systems are required to interconnect with the private line networks of the established carriers, and maintenance of the integrity of the system is a prerequisite for interconnection; such lines could be used within the nationwide network in time of emergency. We leave it to the FCC with the advice of the Executive Branch, in passing on specific applications, to decide whether additional design or technical constraints on interconnection or requirements for compatibility should be imposed in the interests of national security. If the Commission finds that additional constraints are needed, it should also determine by whom the cost of adaptation should be borne.

C. Self Contained, User-Owned Private Systems and Terminal Equipment Should be Permitted to Interconnect into the Message Telephone Network, Subject to Protection of System Integrity by Development and Publication of System Standards and, Where Necessary, Provision of Protection Equipment

Until now, customer-supplied terminal equipment has been allowed on private lines, but it has not been allowed on the switched network unless a protective interface device (including a modulation/demodulation unit) is provided by the carrier. One justification for this distinction has been the need to maintain the integrity of the system. Signals generated by customer supplied terminal equipment on private lines generally do not employ the complex switching apparatus of local exchanges. Use of such customer-provided terminal equipment was therefore thought to involve less danger of interference with the integrity of the system than use of such equipment on the switched network. For similar reasons, the telephone companies previously prohibited all interconnections of private systems into the switched network. However, the FCC has recently declared illegal the telephone company tariffs containing general prohibitions against use of customer-owned modulation/demodulation devices and interconnection of private systems for interstate communications. */ The Commission's decision stated that it was illegal to prohibit devices and interconnections, in the absence of a showing that they are harmful to the telephone network.

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*/ In re Carterfone, 13 F.C.C. 2d 420 (1968).

In response to the Commission's decision, the telephone companies have filed new tariffs to permit use of customer-owned terminal devices and interconnection of private systems, subject to a number of limitations which the telephone companies say are necessary to protect the integrity of the switched network. These limitations would require the customer to comply with technical specifications set forth in the tariff; and to use a protective interface device and a network control signalling unit supplied by the telephone company.

These protective measures, some of which are still under challenge before the Commission, would appear to reduce in importance the issue of "system integrity" which has long been the basis for excluding private equipment and systems from use with the switched network. If so, the path would be cleared for the development and use over the switched network of a wider range of terminal devices (particularly specialized terminal equipment necessary for transmitting data) and perhaps also of private communications systems.

D. We Agree With the Consensus of Views Presented by the Parties to the Computer Inquiry that Remote-Access Data Processing, or Teleprocessing, Does not Presently Exhibit Characteristics Justifying Comprehensive Public Utility Regulation

The filings in the FCC's computer inquiry have illuminated problems of competition and entry in the field of communication with and among computers. Although it will be many months before the Commission issues a report, it is not too soon to comment on the issues of policy raised in this pioneer inquiry.

There has been some talk of nationwide "computer utilities." This notion assumes that economies of scale in computation and the advantages of shared equipment are so great that eventually most users will find it economic to procure data processing from a single central computer, or perhaps from a few regional computers. However, this vision of the future overlooks the fact that computer costs are declining more rapidly than the costs of long-haul transmission. Although computer time-sharing will undoubtedly increase from its present level, the long run balance between the cost of duplicating data storage facilities and the cost of gaining access to a central computer favors the first option. Moreover, teleprocessors are far from overcoming the high costs of managing a time-sharing system, especially one that serves users with diverse processing requirements.

A wide variety of computer services and a healthy pace of entry exist in this field. At this time, it appears that all but the most highly specialized computers will be able to operate at full capacity without seeking a regional or national market. Under present circumstances, our studies provide no basis for recommending the comprehensive regulation of rates or entry in the computer business on the basis of public utility principles. Of course, the FCC's comprehensive computer inquiry will provide more definitive answers, and may reveal specific problems requiring regulatory action. Furthermore, as technology continues to push forward, the factual basis for our current judgment may change. But considerable time remains before such issues become acute.

1. Under present circumstances, the telephone companies should not be permitted to offer teleprocessing. In our view quite properly, AT&T has disclaimed any interest in becoming a data processor. This policy is consistent with the

principle that its scope of operations should be limited to the area for which its public franchise is justified -- in this instance, the management of the integrated public message communications network, and related communications services. The economic strength of a protected market should not be used to gain advantage in tenuously related competitive markets.

To be sure, this principle might lead to uneconomic results if the Bell System's new computer-like circuit-switching system (ESS) were adapted to perform some data processing either as a secondary function or in off-peak hours. However, the ESS, designed for the primary function of analog circuit switching, and with its memory and control completely occupied by specialized telecommunications programming, could not be efficiently adopted for general-purpose data processing. While a policy of excluding the telephone companies from data processing may require re-examination if future generations of computerized switching centers exhibit enormous economies of scale, it seems sound for the present.

2. We find no convincing case for extensive regulation in store-and-forward switching and in hybrid data processing/store-and-forward switching services. At some future time,

the telephone companies' switching computers may become the most efficient instruments for store-and-forward switching. A single systems manager may be required for an interconnected network of store-and-forward switching and data-processing computers cutting across industry lines. But the prospect is remote. Certainly it will not come until the message telephone system is completely digitized. In part because of its great expense, computerized store-and-forward switching has grown up only within single firms, governmental agencies, or among closely connected entities. Today, store-and-forward switching is primarily an incidental feature of teleprocessing services which already provide leased line connections between terminals. Even the few common-user systems provide only in-house communications; they do not connect terminals belonging to different customers.

A single store-and-forward carrier would have to accommodate, on a single set of facilities, terminals with diverse line-speed, response-time and storage requirements. Such diversity would add to the costs of the system, offsetting the economies of scale of a single supplier. Most firms avoid these diversity costs through in-house or intra-industry systems where limited compatibility problems arise, and where the user or users association can provide whatever coordination is necessary. On the basis of our studies, we cannot conclude that store-and-forward switching should now be provided by the telephone companies, or that the numerous firms which provide it need now be regulated as common carriers. */

The principal complications for policy at this time have arisen from Western Union's vigorous entry into store-and-forward switching via the SICOM and INFOCOM offerings **/ and its desire to provide hybrid data processing/store-and-forward switching services. Since neither pure store-and-forward switching nor hybrid services seem to involve natural-monopoly elements, it is doubtful that only regulated carriers should be permitted to make such offerings. As discussed more fully in Section IV, however, we see no reason to exclude Western Union from either store-and-forward switching or hybrid services.

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*/ Some day specialized switching service for data users may become a natural monopoly at least within a particular geographic area. When teleprocessing moves to a separate digital network with time division switching, economies of scale may become very strong.

**/ SICOM is a specialized store-and-forward message switching service for the investment community; INFOCOM is a similar service for general business users.

E. Subject to Appropriate Technical Standards, Line Brokerage and Sharing by Companies Providing Store-and-Forward Services, as Well as Line Sharing by Any Private Line Customer, Should be Permitted

Line sharing and brokerage for purposes of store-and-forward switching are essential to promote promising new computer services on a competitive basis. Firms that supply teleprocessing and data retrieval services lease lines from carriers to connect their customer terminals to a central computer. Under existing brokerage restrictions, these firms are forbidden to allow their customers to satisfy a potentially wide range of communications needs among themselves. Relaxation of this restriction would permit reductions in costs to these customers through more efficient use of their facilities, and would permit the firms to offer store-and-forward switching services using the same computers.

The line sharing prohibition retards development of another important function: the collection of individual signals for transmission to distant terminals. Individual teleprocessing firms are allowed to collect signals from authorized-user terminals. However, as a consequence of the line sharing prohibition two or more firms cannot jointly share these lines. *[*/]*

Since leased lines are not interconnected with the public message telephone switched network (and with a fully interconnected network of store-and-forward switching computers a remote possibility) there are no overriding considerations of system integrity to support the tariff prohibitions. Nor do these specialized teleprocessing networks offer a threat of becoming an alternative to public message telephone service. Even when consumer teleprocessing services develop (e.g. computerized banking) they seem destined largely to utilize the switched network, with the touch-tone telephone in many cases generating the necessary data signals. Therefore, leased line networks will remain a costly communications medium limited to users who exchange large amounts of data, while the telephone network will remain indispensable for general purpose two-way communications.

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*/ Authorized users are customers of the firm leasing a line from the carriers. Authorized users are allowed to use the line for communication with the lessee, but not with one another or even between branches of their own organizations.

A more substantial concern underlying the traditional restrictions on sharing, resale or subdivision of private lines is fear of line arbitrage which would erode the carriers quantity discount tariffs. If a middleman could buy in bulk at the Telpak rate and resell to small users, a pricing structure which discriminates in favor of large users could be seriously eroded. But we cannot regard this a major problem. In fact, the erosion of such price discrimination may be a desirable result of our recommendations for competitive opportunity. By the same token, we find no persuasive reasons for placing limitations on the sharing, brokering, or channelizing of individual private lines in order to achieve more efficient use of these lines.

We understand that AT&T is planning to file in January 1969 a new tariff including modifications in line sharing restrictions. Presumably the FCC will reach conclusions about line sharing and brokerage in its current computer inquiry.

III. OPPORTUNITIES FOR ENLARGED ACCESS TO THE MARKET FOR COMMUNICATIONS EQUIPMENT SHOULD BE EXPLORED

Progress in the development and manufacture of communications equipment is clearly an important condition of progress in the provision of communications service. While experience in providing service is a stimulus to the development of equipment, the service in the end cannot be better than the equipment used in providing it. National communications policy should be concerned that every potentiality for improvement in equipment is fully exploited.

The telephone industry is characterized by a structure of vertical integration. Western Electric, a wholly owned affiliate of AT&T, supplies nearly all the equipment (either through direct manufacture or through outside purchase) to the rest of the Bell System. A similar relationship exists between General Telephone's operating companies and their manufacturing affiliate Automatic Electric.

The question has frequently been raised about whether these kinds of affiliations are most conducive to technological advance, good service commensurate with needs of users, and low cost. In addressing this question we find a number of conflicting arguments.

On one hand, the carriers claim that affiliation is justified by special considerations which do not necessarily apply in other industries -- where comparable ties are forbidden. In particular, Bell officials maintain that the unsurpassed quality of communications service in the U.S. is made possible by the Bell System's ability to coordinate closely research, development, design, manufacture, and operations. They argue that teamwork among the Bell Laboratories, Western Electric, the operating companies and the Long Lines division has yielded the optimum results in service to customers -- as measured by costs, quality and prompt availability of services. Moreover, they maintain that manufacturing affiliation does not foreclose competition, since about one-half of the approximately $3 billion in annual sales by Western Electric to the rest of the Bell System represents procurement by Western Electric of supplies, materials, and equipment on a competitive basis from outside firms.

On the other hand, some maintain that independent manufacturers are deterred from attempting greater access as a consequence of the industry's structure of ownership. This, they argue, constitutes a serious loss on grounds that, among other things, manufacturers not affiliated with carriers have made very substantial technological breakthroughs in telecommunications markets where entry is free -- notably in satellite communications. Moreover, they argue that even if operating companies were required by law or company policy to purchase through competitive bidding, the intimate relationship between the operating and manufacturing arms of each system would make it difficult for outside suppliers to make their maximum contribution.

In the very brief time available to the Task Force, we have found mixed and only fragmentary evidence relating to the effects of vertical integration in the industry on innovation and market behavior. In theory, the carrier's control of manufacturing could lead to a variety of undesirable consequences, such as uneconomic pricing, inadequate response to opportunities for innovation, and inefficiency. We have no convincing evidence that the performance of the principal manufacturer, Western Electric, has exhibited these tendencies. Moreover, we lacked the time and resources required to seek meaningful comparisons, taking into account all the relevant factors, between Western Electric's profits and performance and those of independent firms.

Dissolution of the ownership ties between Bell and Western Electric has sometimes been suggested as the best way of obtaining the full benefits of diversity and competition for the industry. In view of time constraints, we have not had the opportunity to study this question in depth or to evaluate critically the arguments that an extensive degree of vertical integration is necessary. On the basis of the limited studies which our timetable has permitted, we are not in a position to make a firm recommendation on the question one way or the other.

It is, of course, outside our competence to express a judgment on the AT&T-Western Electric tie regarding its consistency with the antitrust laws. That issue must be left to the Justice Department and to the courts.

The question of dissolution aside, we favor access by outside suppliers to the widest extent feasible. For the lesson of experience in most industries is that innovation is a function of diversity and competitive pressure. While the high degree of automation and requirements for system design once placed the telephone industry apart from the rest of the economy, these characteristics now typify other industries as well. With the convergence of communications and computer technology and the growth of the aerospace industry, a number of firms have potential as innovators and manufacturers in the field of advanced communications equipment.

We believe that public policy, and enlightened company policy, should seriously explore every possibility of enlarging opportunities for competitive access to the market for communications equipment, beyond the present level of outside market procurement by the carrier affiliates. Clearly, it is in the public interest to make certain that where and when competition can provide such carriers with equipment that meets compatibility, technical and operational standards, and that is less expensive than the equipment of an affiliated manufacturer, the carrier should purchase accordingly.

This implies that information on future procurements be made as widely available as is practicable. It implies also that when systems have passed through the development stage, stable components, where feasible, be broken out for procurement in the open market.

IV. INSTITUTIONAL AND REGULATORY CHANGES WITH RESPECT TO THE OPERATIONS OF WESTERN UNION APPEAR DESIRABLE

A. In Order to Maintain a Viable Public Message Service, Cost Reductions are Essential. Partial Consolidation of this Service with the Post Office Should be Explored

Western Union is now principally engaged in four related fields of activity -- the provision of a public message telegraph service (PMS), a teletypewriter exchange service (Telex), private line services, and an increasingly active role in teleprocessing. As is well known, its public message service has been declining in volume. Although other factors have played a role in the decline, the reduction of rates for long distance telephone service relative to the constantly increasing rates for telegraph service is one of the paramount causesof its present condition. Since that trend is likely to continue, we doubt that PMS as presently organized has a bright future.

Among the possibilities for strengthening PMS, perhaps the most promising would involve partial consolidation of telegraphic services with the U.S. Post Office. */ If the public message service were to have a service counter in all or most local post offices, the cost could be less than Western Union presently incurs in maintaining its own offices. Yet the coverage would be much greater because the number of post offices is more than double the number of telegraph offices. Moreover, consolidation of PMS's messenger crew with the Post Office's much larger force might result in additional savings.

We have not attempted to explore the many questions of detail that must be resolved prior to even a limited consolidation of postal and telegraph services. We are convinced, however, that it is a realistic and attractive objective whose consideration should be a matter of high priority.

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*/ Some small-scale tests have been made of the use of special delivery mail for the delivery of telegrams.

If the public message service cannot be reinvigorated through a cost-reducing consolidation, the abandonment of the service would merit serious consideration. No doubt, should nationwide PMS disappear, a record service would continue to be offered among the larger cities. The fundamental question, therefore, is whether we ascribe to telegraph service the same values as telephone service -- a service whose widespread availability is sufficiently important to justify financial support, through rate averaging, in sparsely populated areas from prosperous heavily travelled routes.

B. Western Union's Status as the Supplier of PMS Deserves Further Study

A question, separate from the viability of the public message service, is whether Western Union should continue as its supplier -- either through its own offices, or as a co-venturer or co-tenant of the Post Office. Although Western Union has been less than enthusiastic about PMS's prospects, it does see a minor role for the service in its own plans for becoming an integrated record carrier. As Western Union's modernization program progresses during the

1970's, an increasing portion of PMS traffic will move over the Telex network; and the two services will share with Western Union's data processing customers the store-and-forward switching capabilities of its new computers. These plans suggest that economies would exist in providing the public message service jointly with Western Union's other offerings. One of the most useful findings that might come forth from a FCC's impending investigation of Western Union is whether, in fact, PMS is most efficiently provided over these facilities.

The notion of a public message service implies public utility regulation. But Western Union's data processing ambitions have taken the company into competitive areas. Some have questioned whether Western Union will be able to amortize its $800 million investment in computers unless it is permitted to use them for data processing and information retrieval services. In addition, the store-and-forward switching market, which it has already entered, is likely to be competitive; and there are large economies in offering this service jointly with data processing. Even teletypewriter exchange service may no longer be monopolistic, if customers may in the future have the option of buying their own terminals and employing the telephone network in accordance with AT&T's recent tariff filing.

Of course, it is not inconceivable for the same company to provide regulated and non-regulated services. But the complex accounting task of separating the cost of one service from that of another would impose a heavy burden. In view of Western Union's general pessimism about the future of PMS, it would be proper to consider alternative suppliers of the service if the FCC investigation discloses that joint economies between PMS and other services of Western Union are not substantial, and if an arrangement with the Post Office proves unattractive or unworkable. As one possibility, the telephone companies could assume responsibility for the service, either using their own widely scattered offices or obtaining office space from the Post Office and sharing its messenger force.

C. Western Union Should be Permitted to Compete on an Unregulated Basis in Teleprocessing

Western Union lacks substantial monopoly power in other markets which it could bring to bear on non-regulated competitors in teleprocessing. The dangers to fair and effective competition from its entry into competitive markets are accordingly far less than in the case of the telephone companies. The public message telegraph service and Telex, Western Union's monopoly markets, (assuming it acquires TWX), simply do not confer substantial market power, due to the ready substitutability of other services (telephone, in the case of PMS, dataphone using teletypewriters or facsimile in the case of Telex-TWX). Any monopoly power presently possessed by Telex-TWX may be eroded by the alternatives arising under AT&T's proposed new tariff dealing with the connection of private teletypewriter and facsimile equipment to the telephone network through its interface device.

Perhaps Western Union has some advantage over potential competitors in that it controls its own transmission lines; but if our suggestions on interconnection and line brokerage are adopted, these competitors will be able to subdivide bulk capacity leased from Bell or build their own transmission links. With multiplexing equipment to concentrate messages for long distance transmission over these lines, they might be able to achieve the same transmission economies as Western Union. */

D. If Western Union Continues to Provide Public Message Service the Recommendations of the FCC for Consolidating Telex and TWX Appear Sound

If Western Union continues to provide PMS, the consolidation of AT&T's service and Western Union's Telex service under Western Union proprietorship seems justifiable. No economic case exists for maintaining two separate services.

Whether or not transfer of TWX to Western Union is ultimately concluded, full interconnection between TWX, Telex and a modernized public message telegraph service network is desirable. If user terminals are permitted to interconnect into common carrier networks, subject to appropriate conditions, the consolidation of TWX and Telex would not seriously reduce the overall level of competition. At the same time it would reduce the level of duplication (for some companies now have TWX and Telex machines side

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*/ Western Union presently obtains leased lines from Bell under special non-tariff contract arrangements at lower rates than the general tariff for leased lines available to non-franchised teleprocessing carriers. Establishing conditions for effective competition in teleprocessing may require review of this policy.

by side), and it might contribute to the longer-run financial strength of Western Union.

E. Further Study of Western Union's Alternative Futures is Clearly Warranted

Western Union sees an important role in its future as a prototype supplier of competitive teleprocessing services. And the acquisition of TWX by Western Union has much to commend it. Teletypewriter exchange customers would be managed by the carrier that has shown the greatest interest in promoting its development; and wasteful duplication would be avoided. But the merger of TWX into Telex is not the only way of achieving the full interconnection that would be its primary benefit.

Ultimately, the question of Western Union's future in the regulated sector of the communications industry turns on issues of fact that should be resolved in the FCC inquiry. The root question remains: are PMS and teletypewriter exchange complementary to the message switching and data processing services on which Western Union has staked its future? If a teletypewriter exchange network remains viable, would it still confer monopoly power sufficient to justify the costs of regulation?

A negative answer to these questions would suggest that serious consideration be given to solutions which would enable Western Union to move forward in teleprocessing, while locating its regulated communications services elsewhere.

The situation is further complicated by possible developments in the international field. If a single international transmission entity is formed, as we recommend in Chapter Two, a new role may develop for Western Union in the provision of service functions previously performed by the international record carriers. Certainly such developments should be taken into account by the Commission and the Congress in their future deliberations about the evolving structure of the domestic and international industries.

V. EFFECTIVE REGULATION, AND EFFECTIVE IMPLEMENTATION OF THE POLICIES PROPOSED HERE, REQUIRE STRENGTHENED CAPABILITIES BOTH IN THE FCC AND IN THE EXECUTIVE BRANCH

A. Regulation of the Integrated Common Carrier Communications Network Remains Necessary. It Should be Modernized, Certain Omissions in the Communications Act of 1934 Should be Redressed, and More Stress in Regulatory Policy Should be Placed on Responsive Pricing Practices, Incentives for Cost Reduction, and Reliance on Market Incentives

The Communications Act of 1934 is the basic charter of the communications industry and of communications policy. It was based on studies made during the twenties and early thirties, and addressed to a communications industry as archaic, compared to modern media, as the horseless carriage is to the jet plane.

To be sure, the statute has proved capable of adaptation. It has had some of the desirable flexibility of constitutional provisions, as the FCC has grappled with one after another of the problems of revolutionary change. However, the Commission has endured periods of travail, as it sought to resolve difficult and highly contentious disputes, in carrying out policies dimly articulated and directed to conditions no longer prevalent. */

In 1934, the communications industry consisted of disconnected sectors, each endowed with considerable degrees of monopoly power. The distinction between voice and record service is fading. Traditional telegraph service is in economic difficulty. And the telephone network is experiencing the flood tides of change involving private line and other specialized services, computer interconnections, complex relationships with various forms of television transmission, and future accommodations to the use of satellites.

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*/ Like other administrative bodies, it has a number of fundamental problems of the utmost importance to the development of the administrative process. These are issues being examined by the Administrative Conference of the United States. Our observations are confined to substantive issues of regulatory policy within the scope of our mandate.

Today, the industry is a dynamic combination of competitive and monopolistic markets, all related, and all going through processes of rapid transformation.

We cannot predict how the balance will evolve between competitive and the monopolistic elements of the industry. At present, responsible public policy should be directed toward maintaining and modernizing traditional methods for regulating the monopoly sector of the industry -- the integrated network of public message telephone services -- while prudently releasing the competitive energies of the industry elsewhere.

B. The Communications Act of 1934 Requires Certain Amendments, in a Rapidly Changing Technological Environment, in Order to Make Effective Regulation Possible

The basic principle of regulation in the telephone industry -- as well as in most other regulated industries -- is the limitation of the company to a "fair rate of return" on its investment. The rationale for controlling profits is clear and compelling. One would judge a situation highly inequitable if owners and managers could reap disproportionate profits as a consequence of monopoly power derived from a public franchise.

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In reaching conclusions as to a fair return on the fair value of a carrier's rate base, even under the sophisticated and elastic tests of modern Supreme Court cases, the work of the FCC would obviously be incomplete if it had no voice over the composition of the rate base. We emphasize that the Commission should not trespass on the managerial functions of the carrier. But its regulatory functions require an adequate opportunity to review the major investments which constitute the interstate rate base.

In a capital-intensive industry like telecommunications, construction and other investment programs are the most important determinants of overall costs. Under Section 214 of the Communications Act of 1934, FCC approval was made a requirement for new lines and extensions. Today, however, large investments exist in non-line equipment. Manifestly, rational regulatory policy requires that the FCC have adequate opportunity to review these investments too, in passing on the entire rate base. We recommend that the FCC, and if necessary, the Congress, take whatever steps are required to accomplish this goal.

To assure interconnection under reasonable terms, the FCC should have full jurisdiction over intercarrier agreements. At present ambiguity exists about the authority of the Commission to compel AT&T to provide facilities to Western Union and to regulate the terms of private contract agreements reached between the carriers. The Commission has concluded that it lacks clear authority to require AT&T to provide communications facilities to Western Union other than to provide a joint service to the public. In the past the FCC requested enabling legislation, which we support, to correct this jurisdictional defect. More generally, the authority of the FCC should be made broad enough both to order any carrier to lease or interconnect its facilities to another carrier system on appropriate terms, and to supervise the terms and conditions of such intercarrier agreements.

C. Dynamic Regulatory Policy Should Guard Against Certain Restrictive Tendencies Inherent in the Concept of "Fair Rate of Return"

Regulation depending mainly on rules for limiting profit can inhibit incentives for cost reduction. When a firm is both limited to a fair rate of return and has the opportunity to set prices in monopoly markets that will achieve a fair return, it may not be under strong pressure to reduce costs. Cost reduction would increase its rate of return, prompting the regulatory agency to require lower prices. On the other hand, if the firm is inefficient, the prospect of a fair rate of return, and the availability of secure markets from which to obtain such a return, may provide protection rather than penalty.

These issues constitute one of the fundamental challenges to policy in the field of regulated monopoly. With the inducements and external pressures that exist in competitive industries, either with respect to internal efficiency or external demand, it is difficult for a regulatory agency to gauge whether a firm is operating at maximum efficiency and providing a full range of services, at prices that most satisfy the public interest. This is especially true in cases where promising equipment designs and service alternatives can be proved attractive only after they are tested in an operational environment. Yet it is precisely here -- in innovation and in service offerings -- that the danger exists of the monopoly firm having less incentive to risk new approaches than competitive firms.

These observations describe certain generic economic risks in the regulatory process, apart from those inherent in the shortcomings of men and procedures. They are not intended to constitute an exact description of reality; for, in one sense, they are too gloomy. In practice, profit incentives to efficiency do exist in regulated industries because regulation is imperfect and at best has time-lags. Rates are set only intermittently, and the firm is allowed to keep profits made during the interim. The determination of a fair rate of return is not an automatic process; and regulators, in the exercise of their judgment, may be influenced to a degree by the performance of the firm and other considerations. And it is quite possible that the fear of potentially stronger regulatory controls in the future plays a healthy role in stimulating good performance and in inhibiting excessive exploitation of monopoly positions.

Nevertheless, regulatory agencies have not fully exploited their capacity to use rate regulation imaginatively as an incentive for cost reduction. In terms of legal jurisdiction, regulatory agencies have broad power to devise regulatory standards that provide adequate incentives for efficiency. They can disallow costs, forbid new investments, compel abandonments of service, even revoke a company's license to operate. But these powers are rarely exercised, partly because the absence of yardsticks in monopoly industries makes it difficult to detect inefficiency, and partly because the small size of regulatory staffs forces them to concentrate on traditional regulatory functions.

In our judgment, the main problems of regulatory policy in the future will not be the control of profits as such, important as this issue will continue to be, but management of the interplay between the competitive and the monopoly elements in a manner that promotes internal technical and operating efficiency, and exploits fully new opportunities -- such as the computer revolution, the growth of other new and existing services, and the emergence of domestic satellites.

In treating these issues, the FCC should make fuller and more sustained use of its power to initiate and conduct long-range studies of the industry. That power is among the most important available to any regulatory body. Long-range studies of high quality such as some conducted by the FPC and the FTC could provide a desirable catalyst both in company and in FCC policies. The industry might be led to experiment with promotional rates and other technical and service innovations.

The FCC should explore promising methods of incentive regulation. As the Commission acquires experience in appraising the performance of the regulated firms through long-range studies and shorter term reviews, it may be able to perfect a system of regulation under which the carrier's profit rewards are geared to its accomplishments in reducing costs and improving service. However, such a system would be equitable only if cost and technology trends external to the firm's own performance can be factored out --

a task which requires substantially more technical resources than present budgets permit.

Finally, it is important to remember that the rate of return among regulated carriers is generally lower than that of manufacturing industry in the aggregate.[*/] In part, this discrepancy is justified on grounds that the carriers are in a protected, relatively low risk position such that a "fair" rate of return is judged by regulators to be lower than that for normally competitive enterprise. If additional competitive pressures are introduced along the lines recommended in this chapter, we would expect the FCC to take this additional factor into account in fixing the allowable rate of return in the future.

D. In Certain Cases, the Traditional Approach to Pricing Communications Services Should be Altered. The Burden of Proof Regarding Costs and Demand Elasticities Should be Placed on the Carrier

As we indicated earlier, the traditional approach to pricing communications services by adopting uniform tariffs

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[*/] In 1967 Bell System profits (net of taxes and interest) as a percentage of net assets were 5.79%, compared to 6.90% for manufacturing enterprise in the aggregate.

within a regulatory jurisdiction based upon aggregate system-wide costs is not consistent with permitting entry into specific private line markets on an economic basis. As a result, the traditionally broad conceptions of communications markets must give way to more direct considerations relating to the cost and demand characteristics of specific markets. The levels of aggregation and averaging must be broken apart so that pricing practices can become more responsive to particular market situations.

This change in pricing policy requires that both the carriers and the regulatory agencies devote considerable attention to determinations of the cost and demand characteristics of specific markets. In particular, the carriers must be expected to justify their pricing responses to competition by analyses of cost and demand characteristics of the particular markets where the competition exists.

Correspondingly, the activities of the Commission with respect to pricing should be expanded. It should not base its decisions on jurisdiction-wide analyses, because such an approach may result in accommodation of umbrella pricing practices. Neither can it proceed passively, thereby risking an accommodation of non-compensatory pricing. The Commission must acquire the staff capability to undertake continuing independent studies of cost, demand and market structure characteristics. In addition, the Commission should encourage further experimentation with rate structures and service conditions as a means of developing greater knowledge of price elasticities and demand characteristics.

E. The FCC Requires an Expanded Staff Capability

To deal adequately with these problems as now perceived, the FCC's Common Carrier Bureau should be strengthened. The annual budget for the entire Commission including all of its responsibilities in both common carrier and broadcasting is currently only about $20 million. The Common Carrier Bureau is staffed by less than 100 professionals and the entire Commission has only about 70 more employees than it had 20 years ago.

F. A Stronger Executive Branch Role is Required to Complement the Work of the FCC

If the Executive Branch is to contribute effectively to sound systems planning in the communications industry, it should develop a competence which at present it lacks.

Chapter Nine sets out our recommendations on this important subject.

The new capability within the Executive Branch should include the capacity to engage in a variety of advisory and policy activities. It should have resources for communications systems analysis, and for long-range economic and technological forecasting. Accordingly, the new entity could become a valuable partner of the FCC through many informal consultations on policy and operational problems, and a valuable participant in regulatory proceedings, particularly if it is permitted to appear independently before the Commission in appropriate cases.

CHAPTER SEVEN

FUTURE OPPORTUNITIES FOR TELEVISION

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CHAPTER SEVEN

FUTURE OPPORTUNITIES FOR TELEVISION

I. INTRODUCTION AND SUMMARY

There is no need to belabor the critical importance of the revolution in broadcasting among the revolutions in communications accomplished during the last two generations. For radio and television have accomplished a mutation in the way we live. The average American family has its television set turned on for more than six hours a day. With this intensity of exposure, there are raised problems of structural pluralism and diversity which go to the very essence of our ideals of freedom.

Television is of special importance to government. It is the largest single user of one of the most valuable portions of the spectrum, the very high frequency (VHF) and ultra high frequency (UHF) bands. And its development has often posed difficult problems of interpreting the Communications Act of 1934, especially during the last few years. Pluralism and diversity in the structure of the industry have been contentious issues of communications policy for many years. The pressure and promise of change -- both in technology and in public policy -- have given these problems new dimensions during the recent past.

The potential for diversity in television has never been greater. The central challenge over the next decade will be to achieve a balanced and harmonious adaptation of traditional regulatory policies to new technologies and new initiatives, in order to allow this potential to be fulfilled. Cable television and satellite communication services are important among the technological changes which press hard upon the structure of the industry, and upon older concepts of regulatory policy; the evolution of educational and other special interest television, and the impetus to that development implicit in the Public Broadcasting Act of 1967, are conspicuous among the new initiatives.

A. We Should Seek as a Major Goal a Television Industry so Structured that a Wide Variety of Needs, Interests, and Tastes can be Achieved at Low Cost Both to the User and to the Viewer

At the outset, it is desirable to describe briefly the kind of structure for the industry that national policy has long sought to achieve. In the Federal Communications Act, Congress directed the FCC to "encourage the larger use of radio in the public interest." Although the terms are vague, in practice they have been interpreted to define a widely accepted set of objectives.

First. The structure of the industry should make it possible to cater to as wide a variety of tastes as possible, the tastes of small audiences and mass audiences, of cultural minorities and of cultural majorities. Ours is a pluralistic society, in culture as well as in the ethnic origins and the life-styles of its people. A medium of expression as pervasive as television should reflect and enrich this cultural pluralism.

Second. Television should serve as varied as possible an array of social functions, not only entertainment and advertising, important as they are, but also information, education, business, culture, and political expression.

Third. Television should provide an effective means of local expression and local advertising, to preserve the values of localism and to help build a sense of community, both locally and nationally.

Fourth. To promote these ends, the cost of access to the broadcast medium for individuals or groups who desire access to viewers should be as low as possible.

Fifth. Television has become so fundamental a medium of communication in our society that we must seek to make it available to as many people as possible, rural as well as urban, poor as well as affluent. Hence, unnecessary cost barriers to viewing should be avoided.

Sixth. The fundamental values of a democratic, pluralistic society require that, within the limits of the spectrum, and of economic realities, policy should guard against excessive concentration in the control of communications media.

In balancing and reconciling these goals it is helpful to examine the present structure of the television medium, to estimate potentialities for achieving a structure offering more opportunities for diversity, and to outline the conditions requisite to achieving that potential, without undue cost or the sacrifice of other policy objectives.

1. Unlike other media, television presently provides relatively uniform programs, from a limited number of sources. The core of American television is a group of nearly 600 stations (out of 680 in all) affiliated with one or another of the three national networks. Of the non-affiliated stations,

many depend primarily on material purchased from the national networks. These network offerings are supplemented by those of local stations of various types, particularly those of the non-commercial educational stations.

The television industry has not yet achieved a diversity and variety in programming comparable to that of book or magazine publishing, radio, or movies. The situation is roughly analogous to that of the movie industry prior to the 1950's. Before that time, four or five large studios provided most of the films, and generally aimed at the largest possible national and international audiences for each film. Their policies have been altered by the growth of independent film makers and distributors who cater to specialized tastes and interests and, in many instances, to much smaller markets.

Television holds great hope as a vehicle for local, community or even neighborhood communications. Americans are a mobile people, and sound communication policy should be able to make a major contribution not only in deepening the sense of nationalunity, but especially in binding together local areas as true communities. No aspect of communications policy is more important than measures or arrangements which would permit or encourage the growth of communications of all kinds within localities: the discussion of local issues; contact with local or regional political leaders; tapping local talents; the use of local resources in education, technology, sports, and expression of all sorts of local interests.

In addition, the prevailing pattern of programming, addressed to the broad audience, is not designed to meet the concerns of minority groups. Additional television channels and facilities dedicated to their problems, and to the expression of their concerns, talents and sensibilities are of critical importance to the most fundamental of our national policies -- the fulfillment of our commitment to achieve for disadvantaged minorities equality of opportunity and the full enjoyment of American life.

But the potentialities of television go far beyond their development as a vehicle for self-expression by minorities or distinguishable subgroups who now lack communication media of their own. The number and heterogeneity of books and magazines in this country, and of museums, musical groups, and organizations devoted to every conceivable hobby, sport, and cultural interest attest to the existence of audiences which might welcome the development of specialized national or regional programs devoted to special interests. At another level, we have only scratched the surface of television's potentialities in education -- in instruction, in professional training, and in adult education. And promising though very limited applications of television have been made in support of governmental programs both at the national and at the local level. For example, television might be an effective way to diffuse knowledge about job training and employment if regular services of this kind can be given sufficient channel time.

2. For our goals to be satisfied on a significant scale, a low-cost multi-channel capability may be required. In order to exploit the potentialities for diversity and localism in television to satisfy these kinds of needs, several conditions must be met. First, the broadcasting system must possess the capacity to bring a significantly larger number of different television signals into the home than is now the case -- although the precise number, which depends on local conditions and needs, cannot now be specified. Second, access to the medium must be readily available to many potential users of limited resources. The

cost of broadcasting to the user is, of course, a crucially important factor. To the extent that a television signal cannot be delivered other than over a broad area, as is generally true today, the natural inclination of the broadcaster attempting to cover his costs is to appeal to the common interests of the residents of the entire area rather than to the special interests of a neighborhood, a precinct, or a small but scattered interest group within the broader area. Thus, the broadcasting system should be structured to enable pin-pointing the desired audience for a particular signal or to reach the smaller group within the broader area at a reasonable cost. Finally, since television has much to offer to the poor or disadvantaged, costs to viewers should be kept as low as possible.

B. The Purpose of this Chapter is to Indicate Ways in Which Technological and Business Developments Plus Regulatory Policy Could Contribute to Our Goals.

Under existing conditions of technology and cost, the evolution of the industry towards a pattern of broad-ranging diversity is difficult to envision. Although other factors are also involved, the most basic considerations are (1) the high cost of establishing an over-the-air broadcast station; (2) the absence of cost-reducing innovation in designing and marketing programming materials and (3) the dependence of commercial stations on advertising revenues, and of non-commercial stations on public funds and voluntary contributions. These factors together explain why many UHF allocations have not been exploited, why the performance of many educational stations has generally been weak and, more basically, why television is today viewed largely as a mass-audience medium.

We consider a variety of measures which have been put forward as possible contributions to the goal of diversity. These include low-power UHF stations; pay TV; federal assistance to defray some of the costs of facilities and programming of the non-commercial stations, perhaps leading to a new non-commercial network guided by the Public Broadcasting Corporation; and the possible development of a fourth commercial network.

1. We conclude that the distribution of television to the home via cable is a promising avenue to diversity.

We conclude that one of the most promising avenues to diversity is the distribution of television to the home by means of cable. Cable television has developed because it has been able to offer two services for which people are willing to pay: access to more stations than are available over-the-air through normal roof-top antenna and a clearer signal than is often available over the air. Cable television can provide an abundance of channels at a relatively low cost per channel; it is potentially well adapted to selective distribution to particular audiences, even if they are scattered throughout a city or area; it provides an effective vehicle for raising money to support television from the viewers themselves (through subscription fees), thereby increasing the resources available for the support of additional programming; and it is already a thriving business able to prosper without governmental subsidy or protection. Cable systems now serve some three million subscribers, out of some 58 million homes equipped with television.

2. We recommend that policy be designed to ensure an adequate level of service over the air, without inhibiting unduly the growth of cable television.

To be sure, unregulated expansion of cable television could involve serious social costs. Those who cannot afford or prefer not to pay the cable subscription fee, or those who cannot be economically served by cable, or have portable television sets, would be injured if the spread of cable transmission so eroded the base for over-the-air service that the service would be destroyed or radically diminished in coverage. Such prospects seem unlikely. Nonetheless, we believe that these prospects should be acknowledged and that essential safeguards be designed to ensure an adequate level of free over-the-air service without unduly retarding the promising expansion of cable television in accordance with consumer preferences.

The emergence of cable television as a major distributor of information and entertainment will raise problems relating to control of and access to individual cable systems. Insofar as cable television companies originate programs, or bring in signals not otherwise available in the locality, they compete with existing broadcasters, and thus present complex issues of conflict of interest and market control. We note these as serious issues which deserve continuing attention by Congress, the Justice Department and the FCC. Attention should also be paid to conflicts of interest that might arise from multiple nationwide ownership of cable systems as well as cable ownership by television networks, movie producers and distributors, local television stations, and publishers of national magazines. And we note the problem of delineating conditions of access to cable systems by prospective users, and the possibility that some day the imposition of partial common carrier status on cable television systems may be found necessary.

3. We anticipate an expanded role for government and for the Corporation for Public Broadcasting. Finally, we conclude that rapid and effective exploitation of TV's potential for serving important public purposes requires that the Executive Branch assume greater promotional responsibilities, and in particular explore with local and state authorities promising possibilities for pilot programs for community television in disadvantaged areas, and that the Corporation for Public Broadcasting play a leading role in programming innovations.

II. THE HISTORY OF BROADCASTING INDICATES THAT COMPLETE RELIANCE CANNOT BE PLACED ON A SYSTEM OF LOCAL OVER-THE-AIR STATIONS TO ACHIEVE OUR GOALS

A. The Regulation of Radio on the Basis of the Local Station Concept Limits the Program Choices Available to the Listener

The present structure for broadcasting was foreshadowed in the 1920's during the early days of radio. The shortage of radio frequencies, and attendant risks of interference among broadcasting stations led to the imposition of a comprehensive federal licensing scheme. The premises and methods of this regulatory design were carried over to television essentially unchanged.

Under the Federal Radio Act of 1927, which in this regard was substantially re-enacted in the Communications Act of 1934, the Federal Communications Commission was assigned responsibility for determining the number of transmitters and approving locations, frequencies, powers, types of antennae and hours of operation. Decisions of this kind have represented a balance between technical alternatives and public policy. Specifically, they were designed to ensure that broadcasting stations served particular cities and communities, and were allowed only enough power to cover a particular area.

The concept of a nationwide scheme of local stations produced a relatively large number of individual stations for the nation, but relatively few accessible broadcast signals for the individual listener. If high-powered regional or national stations had been preferred to the local station scheme, a larger number of signals, and, accordingly, a wider variety of program choices would have been available to most listeners, but at a sacrifice in the number of local stations in each area.

B. The History of Television Regulatory Policy Has Been Marked by a Search For Diversity in Television Programming Within A System Based on Local Over-the-Air Stations

When television became commercially feasible in the 1940's, it posed thornier problems of regulatory policy and industry structure than had radio. A television channel requires far more bandwidth (or spectrum space) than a radio channel. In the only portion of spectrum usable for television broadcasting in its early days, the VHF band, there is room for only 12 television channels. Moreover, adjacent channel interference, as well as interference between transmitters using the same channel in adjacent cities, prevented the assignment of more than a few channels within each locality.

As the industry grew in the years immediately following World War II, serious consideration was given to several methods for expanding the number of programming choices. These included use of ultra-high frequency channels to supplement those available in the VHF band; the creation of noncommercial stations supported by charitable and public funds; attempts under the federal licensing power to require "balanced" program schedules; and projects for "pay-television," whereby viewers pay for individual programs, thereby competing with advertisers for the right to choose them. To date, none of these has succeeded in substantially diversifying the content of television programming, either because of technical and economic difficulties, or because of lack of political or financial support.

The FCC recognized the limitations of the VHF band as early as 1945. Its basic solution was to encourage the utilization of higher frequencies in the UHF band for television broadcasting. Despite a generous allocation of UHF frequencies to television, however, the growth of UHF television has been disappointingly slow. Indeed, between 1954 (two years after the Commission's initial allocation to UHF) and 1962 the number of UHF stations actually declined. The immediate reason was clear: Sensing a lack of interest by the viewing public, manufacturers did not build television sets to receive UHF signals; at the same time few viewers were willing to purchase adapters for their existing sets. The underlying reason, which this lack of interest reflected, was that the three major networks already had or were in the process of acquiring a substantially full complement of VHF affiliates. Without network affiliation UHF stations had few prospects of being able to offer the kind of programming that would attract large audiences and substantial advertiser support.

While it is unclear whether UHF would have flourished even with full set penetration, the problem of receiver adaptation unquestionably retarded the growth of UHF. In 1964 the All-Channel Receiver Act became effective requiring that all television receivers shipped in interstate commerce be built to receive UHF as well as VHF signals. Subsequently, the number of homes capable of receiving UHF signals has risen to almost one-half of all the television homes in the country. Full set penetration is foreseeable in the 1970's. Meanwhile, even in the major markets many non-network-affiliated commercial UHF stations are still operating at a loss.

The outlook has brightened in recent years for educational (more accurately, non-commercial or public) television, for which the Commission has reserved a substantial portion of the UHF frequencies allocated to television. Progress has been made especially in states where strong support has been provided by the state government, often through the state university. Long dependent on voluntary contributions, non-commercial broadcasters became entitled to federal assistance in equipment as a result of the passage of the Educational Television Facilities Act in 1962, and to federal assistance in meeting their programming expenses as a result of the passage of the Public Broadcasting Act of 1967. However, a concrete plan and level of financing under the Public Broadcasting Act has not yet been implemented. If this is done -- and we strongly recommend so -- the Corporation for Public Broadcasting could become a vitally constructive factor, helping to meet part of the need for more variety, and a more resourceful localism.

C. The Development of Cable Television Has Been Slowed by the Imposition of Restrictive Rules

While policy-makers tried to nurture the growth of UHF broadcasting, a small group of entrepreneurs introduced a new technology, the coaxial cable, as an alternative to the airwaves for distributing television signals to individual homes. The first CATV ("community antenna television") operators were located in small communities suffering from poor reception due to topographical conditions or remoteness from broadcasting stations. Typically, the CATV operator erected a tall master antenna at a favorable location and delivered the signal by cable to his subscribers. This mode of operation extended the reach of existing broadcasting stations, and was welcomed by most of them. But in the 1960's some CATV operators discovered that they could market their service even in communities with good reception by situating their master antenna (or utilizing microwave relay) to capture the signals of distant stations, thereby offering subscribers a greater choice of programs than was available from the local stations. This constituted a threat to the local station, at least to the marginal UHF, and led the Commission to reexamine its earlier conclusion that it would not assert jurisdiction to regulate cable television systems.

In 1965 and 1966, the Commission imposed three restrictions on cable systems on a temporary basis until its policy implications could be appraised. First, each CATV was required upon request to carry the signals of all stations operating in its own area of coverage. Second, CATV's were required upon request not to duplicate the programming of any local station on the same day a given show was aired on the local station. Third, except by waiver of the rule by the Commission in special cases, cable systems in the top 100 markets (which reach some 89 percent of the nation's television homes) were forbidden to import signals from distant stations into their prime reception area. This restriction deprived cable operators of an important selling point in some major markets. The FCC is now considering the possibility of extending the ban on distant signal importation for an indefinite period, on the theory that UHF growth requires shelter from distant signal competition for at least the next 5 years.

The major theme that emerges from this brief historical survey is the continuing effort of the FCC to develop an adequate multi-channel capability without abandoning its traditional goal of promoting the growth of local over-the-air stations. In pursuit of this important policy the FCC has sometimes found it necessary to impose restrictions on a rival mode.

III. THE INDUSTRY'S FULL POTENTIAL FOR DIVERSITY AND LOCALISM IS UNLIKELY TO BE ACHIEVED SOON, UNDER EXISTING ECONOMIC CONSTRAINTS AND REGULATORY POLICIES

A. The Number and Type of Program Choices Available to the Viewer is Severely Limited

Given the limited capacity of the VHF band and the pace of UHF development, it is not surprising that the number of television signals available to most viewers is relatively small. Only about 42 percent of the country's television families live in or near markets served by four or more stations, and another 33 percent three. These choices are, for the most part, choices among the three major networks. Most network stations do relatively little independent programming, and even the independents devote much of their time to network reruns. The educational stations provide some diversity, but they have been hampered by financial problems. As a result many educational stations are not able to provide a full schedule of programs, and many channels allocated to this service remain unused.

B. The Limitations of the Present System Reflect the High Costs and Limited Revenue Potential of Free Over-the-Air Television Service

Present-day limitations of the medium are not the result of perverse forces; they reflect the basic economics of the present system of broadcasting. Contrary to widespread impression, scarcity of spectrum space is not the only, nor the most immediate obstacle to diversity. Spectrum limitations do set limits -- and quite stringent limits -- to the number of channels open to TV programmers. But fully half the UHF channels, both commercial and non-commercial, which have been allocated to television remain unused for lack of applicants.

Thus, the most immediate barrier to prospective operators is not spectrum space, but money -- a reasonably attractive prospect of earnings in relation to prospective costs. Establishing a broadcasting station is an expensive undertaking. Before there is a single viewer or advertiser, a substantial outlay is involved -- legal and related expenses to obtain a license, a transmitter, studio equipment, and other facilities. In a reasonably sized market, the minimum total cost of new entry is roughly $500,000. Seeking sources of revenue to match these costs, the new entrant faces a number of handicaps. Typically he is unable to secure network affiliation, because the networks already have a full complement of affiliates in his area. And lack of network affiliation denies him a major source of station revenue and programming. Typically 20-25 percent of the revenue of network affiliates is in the form of payments from the network for carrying network programs; much of the stations' national spot and local revenue would disappear without the audience base brought in by network affiliation.

Moreover, programming costs are already quite high, and are rising at a rate of about 8 percent a year -- a reflection of general inflation, development of superior but costly new equipment, and a shortage of human talent.

The cost associated with an over-the-air television system has taken its toll of non-commercial as well as of commercial television. Some 162 non-commercial stations are now on the air, but many are not able to provide a full schedule of programs. To be sure, public television is not in competition for the advertiser's dollar; but governmental funds and private gifts have thus far proved an inadequate substitute. The first one-half million dollars a non-commercial station can raise must go to erecting a tower, installing a transmitter, and covering other start-up expenses. The first $1,000 per week it can raise in current funds may be required simply to maintain the equipment and transmit the test-pattern signal. The Carnegie Commission Report has estimated that $213 million would be required in the long run to defray the annual expenses of an adequate over-the-air educational television system. Obviously, there can be no assurance under present circumstances that support will be forthcoming at the required level.

The same cost and revenue factors that deter establishment of additional commercial stations constrain the opportunities for diversity which existing stations are able to provide. Non-network stations, to which one would naturally look for greater diversity, cannot usually afford to forego the largest advertising revenues that they can obtain. Thus, they cannot easily accommodate the impecunious would-be user -- perhaps a neighborhood group or a local political candidate that cannot pay its own way -- in competition with advertising clients. Access by users catering to limited viewing groups is further constrained by the prevalent impression in the industry that viewers tend to stay tuned to a particular channel, which means that if a viewer switches from the channel to avoid a program which does not appeal to him he may be lost to the channel for the next program, if not for the rest of the evening. This uncertainty tends to inhibit the station owner from offering programming which does not attract the largest possible audience at each time slot, even if the sponsor of a program of more limited appeal is willing to pay the station's usual rates.

IV. BETTER USE OF OVER-THE-AIR CHANNELS AND ESPECIALLY THE DEVELOPMENT OF CABLE TELEVISION SHOW PROMISE IN CONTRIBUTING TO OUR GOALS OF DIVERSITY AND LOCALISM

Two possible avenues of improvement merit exploration: exploiting more fully the presently allocated over-the-air channels; and expanding the number of channels available to the viewer.

A. Room Exists for Improving Performance Within the Existing Pattern of Allocations

1. Under present circumstances, the future of non-commercial UHF broadcasting depends largely on the level of public and private support, while that of commercial UHF will remain debatable until a fourth network is developed, or until low-cost sources of programming can be developed. Most UHF stations, commercial and non-commercial alike, are not broadcasting a full day's programming, although the additional cost of keeping a station's transmitter in operation a full 18 hours a day is small. The fortunes of commercial UHF broadcasting will undoubtedly improve as the technical problems that have plagued UHF are overcome. But the basic questions relate to the degree to which technical improvements will enhance the economics of UHF broadcasting and the extent to which diversity and localism in programming will thereby be promoted.

Three technical factors are commonly cited as roadblocks to UHF prosperity and expanded public service. Foremost among these is poor penetration -- the fact that only about half of the nation's television sets are able to receive UHF signals. With some 10 million sets being produced each year, this disability should be overcome by the early 1970's.

The second barrier to first-rate UHF performance is signal strength. This situation principally reflects the reluctance of individual UHF licensees to invest in adequate antenna towers and high-powered transmitters. Though UHF applicants for both new licenses and modification of existing ones have tended to exhibit increasing interest in improving their signal, most UHF stations operate with substantially less power than is required for good coverage. In many cases, the amount of money required to generate a significantly stronger signal is quite small in relation to the amount the operator has already expended on existing facilities. Needless to say, failure to make such an investment on the part of a broad segment of the UHF industry is a measure of the entrepreneurs' cautious estimate of UHF prospects. Therefore, UHF signals can be expected to improve when licensees see other evidence that UHF generally is becoming or can become a more prosperous enterprise.

The third technical problem for UHF broadcasters is the UHF tuner, which at present does not provide the viewer with a convenient "click" when it reaches the correct spot on the dial. More convenient tuning may be a subject of a forthcoming FCC rule but in any case it will be years before all or most television sets have a UHF tuner comparable to that of VHF.

The second level of concern in our assessment of the future of UHF is the potential impact that technical improvements, whatever their pace and range, will have on the industry and its product. It does not appear likely that striking changes can be expected over the next few years in the performance of commercial UHF. Although the independents' share of the audience is slowly rising, the three networks are likely to retain their strong competitive appeal. Under these circumstances, the cost of putting a UHF channel in operation will in all likelihood continue to make independent UHF a rather difficult economic venture.

The prospects for UHF are thus linked to the question of whether and when a fourth network might come into being. Using the top 100 TV markets (which cover about 90% of the nation's TV homes as a guide, a fourth station is now on the air in 40 of these markets, which account for about 57% of the nation's TV homes. (VHF stations provide the fourth outlet in 17 of these markets and UHF stations in 23.)[*/] In addition, a fourth UHF outlet has been authorized (although not yet operating) in about 30 more of the top markets. This suggests that a fourth network, equivalent in size and approach to the existing networks (which have almost complete access to all of the TV homes in the top 100 markets) is problematical within the next few years. Nevertheless, it is conceivable that a new kind of network could start within that time, offering programming different from that of the existing three networks, and contributing substantially to the achievement of our national goals for broadcasting.

Prospects for a non-commercial network, which could help substantially to strengthen the diversity of program

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[*/] Two factors reduce the above coverage figure somewhat as applied to a fourth network. First, UHF market penetration is of course still limited by the number of TV homes without all-channel sets and second, the low power now utilized by some UHF stations may also limit reception. The set factor should be virtually eliminated by the early or mid-70's and there are recent indications that UHF licensees are moving toward higher power to achieve a better competitive status in their markets.

offerings, depend on the kind of direct or indirect aid which Congress, state and local governments, and private foundations are willing to provide to non-commercial broadcast stations. We can expect improved prospects for non-commercial UHF with the principle of federal programming support now established by the passage of the Public Broadcasting Act, and with negotiations under way to implement section 396 (h) of the Communications Act of 1934, authorizing free or reduced rate interconnection services for non-commercial television and radio.

It is unlikely, however, that these remedies alone will alter the existing pattern. Even if expanded financial support were forthcoming and non-commercial UHF stations encouraged to undertake a new range of roles, their future would face limits. For the spectrum space for standard-power UHF stations allocated to non-commercial broadcasters is insufficient for more than a single signal in most areas, and no single channel could meet a major city's full range of specialized television needs. For this reason, non-commercial UHF, desirable and promising though it is, is unlikely to constitute a sufficient solution.

2. Government control of programming content is not a desirable path to greater diversity and localism. Direct government controls are not feasible or appealing in satisfying our goals. Although expressly forbidden to exercise censorship or specific program controls, the FCC has some power over programming practices by virtue of its broad authority over licensing and renewals. However, the Commission lacks the resources for extensive monitoring of licensees' programming, or even for individualized treatment of renewal applications. It is difficult to devise practical standards in so nebulous an area, and it is difficult to expect licensees to act contrary to what they regard as their economic interests.

This is not to say that no progress at all is possible in this area. For example, the development of citizens' viewer associations to facilitate communications with networks, individual stations, and government agencies, seems to us a salutary development.

3. Governmental promotion of new applications of television is a necessary, but not a sufficient, condition.

Certainly not all the barriers to fuller utilization of the television medium are economic or technical. Many of the government mission-support programs alluded to earlier would be feasible today, since their programming costs are low and since the marginal cost of at least some television time on many UHF stations is also quite low. What has been lacking thus far has been an adequate link between the mission agency and the broadcaster -- an "honest broker" who is familiar both with the agency's needs and the medium's costs and capabilities, and who can thus bridge the gap between conception and implementation of imaginative new uses of television in support of public purposes.

We are hopeful that the Executive Branch and the Public Broadcasting Corporation will fill this gap; specific suggestions are set forth in a later section. But such steps cannot be the complete answer. Many of the most important potential uses of television require an expanded multichannel capability.

4. Over-the-air pay television seems unlikely to reach substantial proportions. Pay television may provide a base for increased diversity, since it would enable viewers to compete with advertisers directly for television time and would also provide a source of revenue, in addition to

advertising, to defray the high costs of programming. But the limited experiments that the Commission has authorized with over-the-air pay TV have been disappointing, as viewers have not been attracted in large numbers. Some observers conclude that viewers are more willing to pay a small fee for a cable connection, which can be used at will, than for a specific program or performance as such. An additional handicap is the substantial cost of metering and signal scrambling and unscrambling required to confine reception to subscribers.

Although a multi-city pay television network, with a much larger subscriber base, might prove more economically attractive, an FCC proposal for just such a broadened test has been tabled in the face of congressional opposition. Such opposition reflects widespread concern that an over-the-air pay television network, if sufficiently extensive, could bid away programming from "free" TV, forcing viewers to pay for programming that, it is argued, they now see for nothing. Whatever its merits, this view is tenacious and widely held.

Moreover, even if opposition to pay television waned, and over-the-air service proved commercially successful, the limitations of spectrum scarcity would foreclose an expanded multi-channel capability required to give society the freedom to meet all the diverse needs television is capable of serving.

5. Distribution of television programs by satellite constitutes a promising, but limited, development. As discussed in Chapter Five, the most attractive near-term possibility for a domestic satellite system is a method for the distribution of television programs from point of origination to local outlet for rebroadcast at a lower cost than is the case for terrestrial distribution. By itself this would not increase the number of channels available to the home. Although a reduction in the cost of distribution might well speed up the formation of a fourth major network, or new kinds of part-time or regional networks, this is far from certain. The cost of television distribution is small relative to the cost of programming, and is not the most serious obstacle to a new network. More tangibly, perhaps satellite distribution would promote diversity by virtue of the pledge of Comsat and other proponents to dedicate two channels to the distribution of educational television programs without charge.

In short, more intensive use of existing channel allocations, while promising and worth pursuing, does not obviate the need to explore methods of achieving an expanded multi-channel capability.

B. Although a Number of Methods Can Be Imagined for Expanding the Number of Channels, the Most Promising is Cable Television

1. The high cost and disruptive effects of direct satellite-to-home broadcasting make it unpromising, at least in the near term. In contrast to the "distribution" satellite application noted above, the popular press has recently focused considerable attention on the possibility of using a satellite to broadcast directly to home rooftop antennas. By this means it is postulated that additional television programming could be distributed over the air, providing greater diversity and a capability to reach a variety of audiences too small to support conventional local broadcasting stations.

However, direct satellite-to-home broadcasting faces serious obstacles. To receive even a single television channel directly from a satellite, the individual home-owner would need to purchase a special antenna and converter, whose cost -- with projected technological advances and mass production economies -- seems unlikely to be much below $100. If a 6-12 channel system were desired, the cost of home antenna and converter would likely exceed $100 -- though by what amount is not clear. In any case, coverage of tens of millions of homes would cost billions of dollars. The satellite required to provide such a multi-channel direct broadcast service -- particularly should individual time zone coverage be desired to conform with consumer viewing habits -- would cost far more than the relatively simple "distribution" satellite. Moreover, its weight might well exceed any foreseeable launch capability short of the Saturn booster, which is likely to be inordinately expensive.

In short, at least over the next decade, direct-to-home satellite broadcasting does not appear attractive in comparison with cable or over-the-air broadcast techniques, in combination with distribution satellites, or with conventional terrestrial distribution services, in meeting the particular television needs of the United States.

Quite aside from direct economic considerations, use of nationwide direct broadcast satellites would seriously conflict with the goals enumerated early in this chapter. Requiring highly centralized control over transmission and program origination, and competing directly with local broadcasting stations, such a system would run counter to our quest for expanded opportunities for local expression.

2. Low-powered (10 kw) UHF stations offer distinct, but limited, promise. The FCC has recently disclosed a plan for supplementing the existing table of allocations by authorizing low-powered (10 kw) UHF stations in certain communities. The advantage of the plan is that, with weaker signals, more stations scattered around the country could share the same frequency band. Conceivably, under reduced spectrum limitations many new stations would emerge, tailoring their programming to the needs of a particular neighborhood, precinct or other grouping.

Although, as discussed later, the low-powered UHF station has distinct promise in a limited range of public applications, it hardly offers a complete solution to the problem of diversity. In some urban areas tall buildings interfere with reception. Moreover, the station's signal contour is unlikely to coincide with the geographical bounds of the particular audience that it is designed to serve, and clearly not with those of scattered groups. Finally, even a low-powered UHF station requires a considerable initial investment; with its audience potential much less than that of the standard UHF station, it seems a remote possibility that many low-powered UHF stations could cover their costs.

3. The "video record" offers some potential for expanding the range of visual information and entertainment available in the home, but it is inherently limited to material that does not require simultaneous live viewing, and it does not meet the larger social need for low-cost multi-channel facilities for specialized audiences. A number of firms are currently developing techniques for providing the home-owner with visual information and entertainment in record form, just as phonograph records provide audio information and entertainment. While the video record may become a feasible way to distribute programming that need not be viewed live (such as cultural and instructional material), cost may prove a major barrier to its widespread use in the near future. In the near term, at least, the cost of the player (at least $400 in the United States) and the records (around $15 for one hour of black-and-white or one-half hour of color programming) will put the device in the category of a luxury item for high-income families. And widening the market by distributing the records on a rental basis could prove difficult because of

substantial handling and inventory costs. In any event, however useful in the home, the medical school or the laboratory, this development could not make a substantial contribution to the fundamental problems of community building discussed earlier. As we have stressed, these cannot be dealt with unless channels are available cheaply enough to be used for fractional audiences of special interests. However, if video record quality is sufficiently high, its development might assist cable companies and over-the-air stations in building diversified program libraries at low cost.

4. Cable television holds promise of creating a greatly expanded multi-channel capability. Initially, cable television was viewed primarily as a method of obtaining better signal reception. Picture quality remains an important aspect of cable, especially since over-the-air color signals are frequently of poorer quality than is the case of black-and-white.

More recently, cable has been used to increase the subscriber's range of programming choices, through the importation of distant signals. Twenty-channel systems are now technically feasible, at only slightly greater cost than the twelve-channel systems now being installed. Were there sufficient demand, even greater channel capacities could be supplied. In all areas of the country, twenty channels are more than is necessary to carry existing local stations plus a selection of distant signals. Since the additional cost of utilizing the remaining channels for programming originating within the cable system itself is low, we can expect cable originations to grow. Indeed, some cable operators are already providing channels for local government needs, shopping information, local news, children's programs, the stock ticker, foreign movies and other purposes.

One may, of course, question whether the availability of many channels at low cost will alone evoke sufficient programming originations to fill them. The cost of distributing the additional programming may be slight, but who will defray it? More important, who will defray the costs of the programs themselves? Are there enough advertising dollars to support twenty channels, rather than three or four, when many attract only small audiences?

It is important to bear in mind that advertising revenues are not the sole source of support for a cable system. Subscriber revenues themselves are normally sufficient to cover the costs of distributing the signal. It is not necessary for the cable operator to sell time on every channel to advertisers, or even charge for the use of every channel, in order to defray his expenses and make a profit. On the contrary, he has a positive incentive to offer a varied programming mix, including items which would not attract a commercial sponsor, even if that required him to shoulder a portion of the programming costs. Many individuals may only be persuaded to subscribe to the cable service if it provides programs of particular appeal which they would otherwise be denied -- for some, a series of local college plays or a foreign film festival; for others, a continuous stock ticker; for yet others a college-level lecture series, or a channel dedicated entirely to the problems and talents of one of the particular subcommunities of the city -- an ethnic, religious, or service group. Having an abundance of channels, the cable operator will be motivated to provide such programming. For the costs to him of a modest studio and simple camera equipment are moderate, while the additional options may attract additional subscribers to the cable. Talent and other programming costs ought to be quite moderate for the type of community programming we have in mind.

Another aspect of cable television is its commercial feasibility. Substantial numbers of individuals have been willing to incur the expense (typically $5 per month) of cable service. In the absence of restrictive government policy, cable television will probably continue to grow rapidly. Those willing to pay will be able to enjoy the benefits, in terms of greater variety and diversity of programming, without governmental assistance, promotion or other intervention.

V. THE FUTURE OF TELEVISION

A. Although Further Development of Cable Television Should be Welcomed, Completely Unrestricted Growth Could be Detrimental to Those Who Depend on Over-the-Air Service

Cable television can bring viewers in a given community new programs from two sources -- signals imported from distant stations, and original material specially produced for distribution on the cable system. As mentioned earlier, importation of distant signals has been forbidden in the top 100 markets. In a recent ruling, Midwest Television, the Commission initiated restrictions on the freedom of cable systems to originate programs as well. The decision allowed origination by the San Diego systems involved in the case, but barred the use of commercials to help finance original programs. These restrictions are avowedly temporary, but the FCC is now considering whether to extend them indefinitely. For the concern is that an unregulated growth of cable television in the major markets could destroy or weaken the existing pattern of over-the-air broadcasting, which the individual enjoys without paying a subscription fee.

Were the only injury in prospect financial loss to the owners of UHF stations, one could say that such injury is a normal cost of competition and technical progress. But the interests of those stations' viewers need also be taken into account. It is true, of course, that they can subscribe to the cable, but this is subject to the conditions that they have the resources, and that it is available. While advertiser-supported over-the-air television ultimately imposes the costs of broadcast operations upon all users of the advertised products, the cable user is taxed more directly for the service he enjoys, and some may not be able to afford the fee. In addition, a study conducted for us by Complan Associates indicates that under existing technology the cost of wiring the entire country would be prohibitive. In areas remote from population centers, cable television will not be available, pending some technological breakthrough. The inhabitants of such areas will remain dependent upon whatever over-the-air television service is available, and to the extent such service is eliminated by cable competition, these viewers would be adversely affected.

It is important, therefore, to determine the likely impact of cable development on our over-the-air system. Our studies do not indicate that there would be a serious competitive injury to affiliates of the major national networks, which carry the most popular programs, or to independent VHF stations which are, by and large, well established. The same should be true of UHF stations which obtain network affiliation, a development depending chiefly on the extent of UHF receiver penetration in the particular market. When speaking of expansion or maintenance of over-the-air broadcasting in this context, therefore, we mean primarily the continued development of independent (non-affiliated) UHF stations.

As to whether independent UHF stations would be significantly harmed by less restricted cable growth, only the crudest projections are possible on the basis of the few available studies. Two questions are involved: first, how much will UHF performance improve without competition from cable, with respect to number of stations on the air and with respect to the kind and quality of program material provided; and, second, what marginal difference in UHF prospects will the particular factor of cable expansion make?

In smaller markets, some marginal UHF operations may disappear, as their potential audience is fragmented by cable subscribers who prefer to view stations from other cities or programs originated by the cable system. In larger markets, to which two or more UHF channels have been allocated, the likely impact of increased cable penetration is more speculative still -- in part because the marketability of cable is more questionable where viewers can receive a relatively large number of free broadcast signals. As we noted earlier, UHF independents are not yet in an assured position in many areas, without regard to cable development. Although UHF penetration and signal strength are likely to improve over the next few years, the number of channels allocated to UHF broadcasting will almost certainly not be increased, and the cost of starting and operating a UHF station is unlikely to decline.

In view of these variables, an accommodation between the goal of allowing the development of a multi-channel capability and the benefits of preserving adequate over-the-air service is among the most important challenges to public policy in the field of broadcasting. We can offer no definitive solution to this problem. Information now available is not sufficient to support any final judgment as to the scope of protection which this particular area of over-the-air broadcasting may require against the market force of cable competition.

It is therefore urgent that research and analysis be undertaken to enable policy-makers to fashion a solution carefully designed to maximize society's access to the benefits offered by both technologies. In particular, it is necessary to define the objectives of regulatory policy -- to specify a realistic minimum level of over-the-air service so that restrictions on cable do not exceed the level which the public interest requires. Free enterprise should not be hampered by governmental interventions in the absence of well-substantiated judgments which strike an appropriate balance between the competing social values at stake.

In developing such a policy, several aspects of the problem merit attention:

1. The question of copyright liability must be resolved promptly. -- Under the Copyright Act as recently interpreted by the Supreme Court, cable operators (to an extent not yet fully clear) are immune from liability for programs broadcast by distant stations and carried on their wires to subscribers. In contrast, broadcast stations are expressly forbidden by the Communications Act to carry distant signals without authorization from the originating station.

This difference of treatment is frequently cited as a major argument against removing the restrictions in major markets on distant signal importation by cable television, on the ground that over-the-air stations, particularly UHF stations, are placed at a significant competitive disadvantage, without substantial justification. This consideration has weighed heavily with the Commission in developing its present major market policies.

Efforts to amend the Copyright Act to impose some appropriate measure of liability on cable systems foundered in the 90th Congress in part because the question of liability under the existing Act was then still before the Supreme Court. Now that the Court has spoken, Congress should promptly resolve the problem of copyright liability and competitive fairness. Compromise proposals considered in the 90th Congress that would require compulsory royalty-free licensing, compulsory reasonable royalty licensing, or full copyright protection, (depending on the area of broadcasting coverage) indicate a form of a possible solution that would answer the fairness question in a way that would accommodate both private interests and the public interest. Action by Congress which settles the competitive fairness question would be an appropriate first step in the cable television field, since it would provide a firm basis for the development of regulatory policies designed to gain the full benefits of cable television for the public.

2. Dangers lurk in a "temporizing solution" which, although avowedly temporary, risks becoming, in effect, a permanent decision. -- Since the effect of cable competition on UHF is unclear at present, and since the prospects of UHF even if shielded from such competition are hazy, one alternative would be to continue to "hold the line" against distant signals until some future date, five or ten years hence, to give UHF stations a vital "breathing space" to become established. At that time, it is argued, a more informed judgment can be made as a basis for longer-run policy.

But at the conclusion of such a proposed waiting period, the cable threat to over-the-air stations will not be much less than today. If anything, more stations will have a claim to governmental protection than at present. Whereas the present ban on distant-signal importation was explicitly adopted as an interim measure to give the FCC and Congress time to evaluate the situation and to develop a policy, the premise of a more permanent ban would be to give UHF stations a chance to grow "strong" enough to be able to withstand cable competition. If such a policy were adopted, UHF stations could and would argue with some equity that they had invested in reliance on the rule, and should be protected until they were in fact able to withstand cable competition. Since at any point in time some stations on the air will be economically marginal (if not actually in the red), the pressure for continued restriction could continue indefinitely.

3. To avoid favoring one mode totally to the exclusion of the other, policy may have to be tailored to ensure a proper balance between permitting the growth of cable television and supporting an adequate level of over-the-air service.

As outlined above, we seek a mix of over-the-air and cable television in order to promote diversity of choices available to the widest possible television audiences. If and to the extent this objective will not be achieved by unrestricted competition among the modes, institutional arrangements can be devised. Policy could consider specific government support, or rules requiring private business behavior designed to reach such an accommodation.

B. As Cable Television Grows In Importance, Greater Attention Must Be Paid To Problems Of Control And Access.

1. Serious consideration should be given to the question whether to extend the local market "duopoly" rule to cable systems. -- Since 1940 FCC regulations have imposed limits on the number of broadcast outlets under single ownership in any community. A single individual or entity may control no more than one TV, one AM, and one FM station in a given market. The Commission is currently receiving comments on a proposed rule to extend the policy behind this so-called "duopoly" rule, by permitting a single owner only one full-time broadcast station of any sort in a single market.

It may be necessary in this connection to examine policies with respect to cable ownership. A cable owner necessarily controls a number of channels into the homes of his subscribers; to the extent that these new channels serve as sources for the origination of program material, they will constitute an especially important avenue of influence over community opinion. Acquisition of a cable system by a local broadcaster thus raises questions under traditional policies against undue control of local media. Moreover, acquisition could unduly limit the degree of competition between cable and conventional broadcast. The second of these dangers may be adequately covered by antitrust principles; the first clearly is not. On the other hand, one could defend local cross-media ownership on grounds that the stronger financial base of the owner would contribute to more rapid development of the new medium. In any case, the issue of media ownership deserves more extended consideration by the Congress, the Department of Justice and the FCC.

2. Nationwide patterns of ownership should be scrutinized for conflicts of interest or threats of media domination. -- On a nationwide basis, the control of cable television systems is also a source of concern. Owners of nationally-distributed magazines, television stations, film studios, chains of motion picture theaters, and, especially, television networks, will likely prove to be either competitors of or suppliers of program material, or both, to

cable television systems. In view of these possibilities, both the FCC and the Department of Justice, as well as the Congress, should scrutinize developing patterns of ownership in the cable industry with an eye for conflicts of interest or threats of media domination.

The particular problem of multiple ownership of cable systems may call for especially intensive review by the FCC and, perhaps, for corrective action in the immediate future. With respect to AM and FM radio and television outlets, the FCC restricts ownership by any single entity to seven outlets in each category on a nationwide basis. Similar restrictions may be warranted on cable outlets.

3. Problems of access to cable television systems merit continuing study by Congress, the Commission, and local franchising authorities. -- Regardless of who controls a given cable television system, much of its value to its community and to the nation will depend on its being available to users on as broad and equal a basis as possible. Cable TV systems may involve so many channels that common carrier type regulation may be found necessary, at least with respect to a certain minimum number of channels.

Were common-carrier status to emerge, allocation of authority between local and federal agencies would be necessary and a tangle of difficult issues would be involved. The principal one would be whether to impose a comprehensive pattern of federal public-utility regulation on cable television. The high cost of duplicating cable facilities gives the service the attributes of a natural monopoly. In the more distant future, if cable displaces much over-the-air service, cable owners would enjoy significant monopoly power over television service. As yet, however, significant monopoly power is not discernible.

Moreover, the burden of regulating thousands of cable systems would be immense; ideally, state and local authorities should assume the burden of regulating cable systems, which are predominantly local in character. But local authorities have thus far been cautious in asserting appropriate controls. We recommend, at a minimum, the creation of a central clearinghouse (perhaps under the auspices of the National Association of Regulatory and Utility Commissioners) for the discussion and dissemination of information which will enable the local franchising authorities to understand the breadth of their powers in terms of rate regulation, channel reservations, requirements for local programming and other franchise conditions. The recent report of the New York City Task Force on CATV provides an excellent example of how local authorities might proceed in order to fulfill their public interest responsibilities in dealing with cable systems.

The issue of the responsibility of the cable owner is a growing one. If cable expansion is permitted in keeping with its appeal in the marketplace, we are on the threshold of a new era in broadcasting; while there is much the Commission and the Executive Branch can do to assure a smooth transition to new modes of broadcasting and television service, it is imperative that the nature and extent of regulation of cable systems be explored and decided. It is not too soon for Congress to address these questions comprehensively.

VI. THE EXECUTIVE BRANCH AND THE CORPORATION FOR PUBLIC BROADCASTING HAVE IMPORTANT ROLES TO PLAY

A. Executive Branch Agencies Should Participate More Actively in FCC Proceedings. -- As we have seen, broadcasting offers significant potential as a support to a variety of governmental missions such as health, education, improvement of race relations and elimination of unemployment. Its value in this regard depends largely on the conduct of FCC licensees, who provide broadcasting service. The agencies responsible for missions of the sort listed above have a legitimate interest, therefore, in the conduct and programming practices of broadcast licensees and in proceedings for the grant and renewal of licenses. Under such circumstances the agencies should make their views known to the Commission by appropriate submissions. We have discovered that in general the agencies are unaware of this opportunity to advance their objectives, and we urge their more active participation in relevant rulemaking and licensing proceedings before the Commission.

B. The Government Should Stimulate And Support Pilot Programs To Explore The Utility Of Television To Further Important Public Purposes.

In an earlier section we listed some promising applications of the medium in support of public policy ends. A natural first question is why such programs have not already been tried. The principal answer is that the government has never conducted the kind of comprehensive experimental efforts necessary to test new applications of the medium.

In the preparation of this Report, we sponsored research studies exploring new uses in this area, and our own staff devoted some time to the problem. We summarize the findings of these studies, and commend them as the basis for serious consideration of experiments of this kind.

1. A pilot communications project for South Central Los Angeles is an illustrative example. -- South Central Los Angeles (which includes Watts) is a sprawling Negro "ghetto", inhabited by more than 300,000 individuals, and afflicted by the classic symptoms of urban poverty and decay -- high unemployment, half the mothers welfare recipients, a high student drop-out rate, lack of adequate public transportation, etc. We asked the RAND Corporation to study the feasibility and merits of experimenting with an expanded use of television to meet some of the urgent needs of the area's residents. On the basis of RAND's study and our own analysis, we believe that such a program is well worth undertaking. One of the most attractive technical configurations is a four-channel, low-power

UHF system; with transmitting facilities and four equipped studios it would entail an initial investment of about $750,000. The RAND investigators concluded that the establishment of such a station would not involve a material dislocation of existing television stations or service. Although today some 60 percent of the area's residents lack receivers having an all-channel capability, that figure is expected to fall to 40 or 50 percent by the time a pilot project could actually become operational. Even at 50 percent penetration, such a system would reach more than 75,000 households.

The channels in the system would be devoted to job information and training; to both in-school and at-home instruction tailored to the special needs of ghetto children; to the presentation of programs created by and for the local community; to public health; adult education; literacy training and other purposes. These needs are not currently being met by the television stations in Los Angeles; their programming (with the exception of a Mexican-American station) is not directed to the special needs of disadvantaged minority groups.

We cannot know to what extent these needs can or will be satisfied by television, but we believe that an experiment to find out is certainly warranted. Low-power UHF is the cheapest present day mechanism for the conduct of such an experiment. If successful, it would be important to consider whether such programs should become part of nationwide services, or maintained as local community services, or both, and then to consider what methods would best promote such programs -- cable systems, UHF stations, some mix, or other alternatives.

2. A pilot project for a remote rural area such as an Indian reservation is another possible application. -- Not all of the poor or disadvantaged are urban dwellers. For example, more than 100,000 Indians, mostly very poor, live on the Navajo reservation in a remote rural area in northern Arizona. In view of the Federal Government's historic commitment and continuing programs in the area of Indian welfare, the potential of television to alleviate the plight of the reservation's inhabitants constitutes a fit subject for a pilot demonstration program. Again, a multi-channel UHF system seems feasible for this purpose. Television should prove useful in English-language

instruction, in conducting courses in Indian culture and history, and in disseminating information concerning the Navajo political process.

In both the illustrative examples of Los Angeles and the Navajo reservation, we emphasize that basic responsibility would reside in the communities or groups involved to define their needs, to make decisions about the most suitable kinds of programming to meet these needs, and to operate the system. The role of the Federal Government would be confined largely to appropriate financial support and technical assistance.

3. Implementation of such pilot programs requires greater Executive Branch capability in communications, and the assumption of a new role by the Corporation for Public Broadcasting.

Pilot projects of the kind we have discussed cut across the responsibilities of several mission-oriented agencies -- HUD, HEW, Labor, Interior. No one of these agencies is ideally situated to assume overall responsibility for the projects (although we hope this factor will not unduly delay the undertaking of the projects). None has, or is ideally situated to acquire, the necessary technical expertise. Prompt and efficient handling of such projects would be greatly facilitated by the creation within the Executive Branch of a central source of technical and systems advice and assistance in telecommunications.

However significantly such capability could be expected to assist in coordinating the needs of the mission-oriented agencies and relating them to available equipment options, we do not envision it as expert in programming. Nevertheless, the pilot projects will require highly imaginative and innovative programming of a kind not likely to be available in the commercial sector. It is here, we believe, that the Public Broadcasting Corporation could play a significant role. In addition to its broader responsibilities relating to the promotion of public television, the Corporation is a logical source to which the Federal Government could turn for assistance in developing suitable programming to advance public needs.

The need and opportunities for service by the Corporation for Public Broadcasting will be greatly expanded, if cable television development multiplies the number of channels. The potential for experiment with various forms of non-commercial programming will increase proportionately, and an important opportunity will be wasted if the Corporation for Public Broadcasting is unable to take advantage of these developing possibilities. More important still are the governmental uses, on both the federal and local level, which will be made possible with an expanded multi-channel capability. Many local governments especially will be in need of advice as well as more active forms of aid in determining how to make use of the one or more channels which will likely be reserved for them by cable operators. Conversely, potential producers and packagers of program material useful to governments will be desirous of gaining quick and informed understanding of the ways in which they can be most effective in seeking to serve city and state, as well as federal, interests. Here again, the Corporation for Public Broadcasting can perform a vital role.

CHAPTER EIGHT

THE USE AND MANAGEMENT OF THE ELECTROMAGNETIC SPECTRUM

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CHAPTER EIGHT

THE USE AND MANAGEMENT OF THE ELECTROMAGNETIC SPECTRUM

In this chapter, we address the question posed to us by the President: "Are we making the best use of the electromagnetic frequency spectrum?" This is not a new topic for policy review. It has been a source of great concern to a number of agencies, committees, and commissions in recent years.*/ Their studies have clearly shown that the nation is not achieving the best use of the spectrum in the face of growing demand and increasing shortage. Although many basic recommendations for improvement have been made, few have been implemented. Generally, those infrequent remedial measures taken in the past have proved inadequate.

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*/ Among the major previous studies are: Joint Technical Advisory Committee (JTAC) of the Institute of Electrical and Electronics Engineers and Electronics Industries Association, Radio Spectrum Conservation (1952), Radio Spectrum Utilization (1963), and Spectrum Engineering, the Key to Progress (1968); Director of Telecommunications Management, A Report of Frequency Management Within the Executive Branch of the Government (1966); Commerce Technical Advisory Board (CTAB), U.S. Department of Commerce, Electromagnetic Spectrum Utilization -- The Silent Crisis (1966); Federal Communications Commission, Final Report of the Advisory Committee for the Land Mobile Radio Services (1967).

Our own studies confirm many of the conclusions reached in earlier investigations. Spectrum resources are now being utilized wastefully and inefficiently. In some locations serious shortage prevails. And those problems will become increasingly severe in the face of clearly rising demand for radio communications. Technological and economic change will increasingly generate stresses beyond the capacity of existing policies and institutions to cope with them.

I. THE ELECTROMAGNETIC SPECTRUM IS A VALUABLE NATURAL RESOURCE

Electromagnetic radiation is a form of oscillating electrical and magnetic energy capable of traversing space without benefit of physical interconnections. Radiant heat and light are forms of electromagnetic radiation. So are radio signals. The rate (in cycles per second) at which the energy oscillates is termed its frequency, and the complete range of frequencies is encompassed by the electromagnetic spectrum. That portion of the spectrum usable for radio communication ranges from about 10,000 cycles per second to 40 billion cycles per second.

Aircraft, ships, motor vehicles and other mobile units are critically dependent on radio for rapid communications. Radio is also the dominant technique for providing such disparate services as television broadcasting, long-distance telephony, navigation, radar, and some scientific research. In short, the spectrum is a natural resource vital to the functioning of modern society.

In many respects the spectrum is a plentiful resource since it is not depleted through use (unlike, say, coal and oil), and discrete portions can in general be used simultaneously by many separate radio services. But, as a consequence of their propagation characteristics, some portions of the spectrum can be used only for certain kinds of services; and extensive simultaneous use of identical portions can result in troublesome or intolerable interference. These problems become increasingly severe as the demand for radio communication grows. For example, very low frequency radio signals are especially useful for worldwide services because they can propagate thousands of miles around the curvature of the earth. In contrast, some signals of much higher frequency travel only over line-of-sight paths and are ordinarily useful only for short distance terrestrial services and satellite services. Limitations of frequency range adaptable or available to particular services, combined with increasing demands for those services, has caused an increasing scarcity of usable spectrum in some areas. As this occurs, entry of new spectrum-using services must be restricted or more stringent and costly operating standards must be imposed upon established services.

While the role of spectrum management embraces the entire usable range of frequencies, we are especially concerned with the ranges above 100 MHz.[*] For it is in that portion of the spectrum that we face pressing problems of shortage. It is there that the needs of such services as mobile radio, broadcast television, communication satellites, and terrestrial microwave relay must be satisfied.*/

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[*] The term MHz refers to "megaHertz" or millions of cycles per second; similarly, KHz and GHz refer respectively to kiloHertz (thousands of cycles per second) and gigaHertz (billions of cycles per second).

II. WE ARE NOT NOW MAKING BEST USE OF THE SPECTRUM

A. Growth in Radio Services in the Past Decade Has Been Remarkable

Within the United States over the past decade, the number of radio transmitters has grown at an average rate of over 17% per year. Total authorized non-government transmitters increased from about 1.2 million in 1957 to over 6 million in 1967. An average of less than three transmitters per 1000 persons in 1950 had grown to over 30 per 1000 persons in 1967.

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*/ While we have examined a wide variety of spectrum uses throughout the entire range of frequencies now in use or potentially useful for radio services, a major portion of our specific analyses and recommendations deals with the broad category termed "Safety and Special Services" by the Federal Communications Commission. The reasons for this emphasis are: (a) this category encompasses roughly 98% of all stations and well over 99% of all transmitters licensed by the FCC; (b) with a few exceptions (e.g., communication satellites) these services pose the major problem for spectrum management, both now and in the foreseeable future; and (c) the responsible management and user agencies consider that Federal Government spectrum needs, comprising the major requirements outside the Safety and Special Services category, can generally be handled under existing allocations through the application of improved frequency management capabilities.

This pattern of growth is due to many factors. Most significantly, requirements for higher levels of mobility have combined with technological advances to greatly enlarge the benefits of using radio. America is a nation on the move. People want communication services to match this mobility, and radio is increasingly being called on to provide those services. The ability to dispense with wires which constrain mobility is a powerful incentive to radio use. Moreover, while radio services have always offered mobility, only in recent years has advancing technology permitted widespread use of these services. The advent of low-cost transistorized circuitry has been a major, though by no means exclusive, factor. With the projected development and application of integrated electronic circuits, the trend toward complex yet low-cost radio systems can be expected to continue.

Thus, the two-way radio is a matter of sound economics, whether for police protection, fire prevention, diaper delivery, TV repair, taxi service, cement delivery, or utility service and maintenance. As one example, for certain kinds of services it has been estimated that three radio-equipped service vehicles can carry the same workload as four vehicles without radio,[*] meaning savings of perhaps $50,000 to $100,000 per year.

The general public has also begun to realize the potential benefits of two-way radio. Thus far, a principal user has been the busy executive, who can use radio service effectively en route between business activities. But the rapid growth of "Citizens Radio" (a special classification which includes all two-way radio uses by the general public) is evidence of additional important demand by the public for spectrum use.

B. Spectrum Scarcities are Inhibiting This Growth Under Existing Allocation and Usage Procedures

Despite the growth in demand for radio services, certain potentially beneficial services are being denied satisfactory use of the spectrum. During the period 1959-64, growth in authorized spectrum uses averaged about 22% per year, both in number of users (from 652,000 to 1.42 million) and number of transmitters (from 2.18 million to 4.92 million). From 1964 to 1967, however, the annual growth rate was only about 7%, while applications for spectrum use (which had grown steadily throughout the earlier period) leveled off and in many services began to decline. Statistics for 1967 indicate a significant decline in applications for virtually every category except marine and amateur radio services.

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[*] FCC Land Mobile Advisory Committee, Final Report, Vol. 2, Pt. 2, Section 9.

Although other factors may have contributed to diminished growth, there is reason to believe that spectrum scarcity and congestion, with resultant service degradation, are significant contributing factors. In 1958 the condition in land mobile services (a category encompassing nearly 50% of all authorized transmitters) was described by the FCC as spectrum "congestion," by 1962 as "extreme congestion," and by 1964 as "acute frequency shortage." In March 1964 an FCC Land Mobile Frequency Advisory Committee was appointed to explore steps which might be taken to alleviate these problems "without involving the allocation of additional spectrum space to land mobile service." This committee reported in November 1967 that "no major long-term relief ... can be achieved in the major metropolitan areas ... by further changes in operating techniques and procedures ..."; and further that "additional frequency spectrum must be allocated for this use."

Many land mobile users operate on a "party-line" basis, with numerous users sharing the same spectrum assignment. As demand for the service grows, and as the FCC continues to grant additional licenses to qualified applicants, over-crowding and interference rise to progressively higher levels -- thereby reducing the utility of the service to all users. Moreover, the situation tends to discourage further applications even though additional mobile services might be valuable.

On the basis of various studies we have reviewed, it is reasonable to conclude that over the past decade land mobile services have been unable to obtain sufficient spectrum resources to avoid harmful interference and service degradation in major metropolitan areas. These services have undergone three major equipment conversions since 1950 to reduce the amount of spectrum (bandwidth) required per voice channel, as a way to accommodate more users; but further steps in this direction do not appear economically feasible, nor technically adequate.

Aside from the general problems of land mobile services, there is a specific area of particular concern. The vital communications requirements of state and local entities providing police, fire, ambulance, and related public safety services have become increasingly dependent upon radio. Yet, in the face of a rising crime rate, violence and civil disorder in our urban centers, those services have experienced spectrum scarcity and congestion comparable to that experienced by land mobile users generally.

Finally, some contend that spectrum scarcity has inhibited development of communications satellites. This more recent spectrum claimant has been required to share spectrum bands previously allocated exclusively to microwave radio relay service since exclusive bands for satellites are not available. Concern over the possibility of mutual interference between radio relay services and an extensive nationwide network of satellite earth stations has been cited as a major reason for delay in implementing a fully-operational domestic satellite service (although lack of a comprehensive national program for domestic use of satellites has also been a major contributing factor).

C. Growing Demand for Spectrum Use Will Intensify the Problem

Technological advances will continue to drive the cost of radio communication services down, and demand for radio services is expected to grow rapidly. However, lack of adequate spectrum resources could be a major inhibiting factor unless remedial measures are begun.

Land Mobile Radio Services -- In the past 18 years, the number of transmitters in this service has grown from 180,000 to 2.6 million; by 1975 this number might well double, given adequate spectrum resources. The amount of spectrum now available for this service is about 42 MHz. To handle expected growth, assuming present operating practices, a minimum of 42 additional MHz will be needed in the major metropolitan areas. */ Moreover, in view of the probable need to reassign some present users to reduce excessive interference in existing services, even more spectrum could be required.

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*/ FCC Land Mobile Frequency Relief Committee, op. cit.

Public Radio Services -- Although few studies have been made of the potential demand for radio services by the general public, growth in the Citizens Radio Service provides some general information. The number of transmitters in this service has grown from about 20,000 to 2.7 million since the mid-1950's, and conservative estimates place this figure at close to 7 million by 1975. */ With future technology, these radios need not be significantly higher in cost than conventional AM auto radio. It seems likely, therefore, that a major segment of the driving public might find this two-way radio service desirable -- adding significantly to the demand for spectrum use.

Spectrum allocations now available for public use in the Citizens Radio category total 4.1 MHz, or 10% as much as the congested land mobile service. Yet Citizens Radio transmitters outnumber mobile radio transmitters. To be sure, these users do not require the same quality of service as, for example, a metropolitan police cruiser. Nevertheless, a large potential demand exists for public radio service,

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*/ Director of Telecommunications Management, The Radio Frequency Spectrum, U.S. Use and Management, September 1968, p. D-27.

and in some geographic areas congestion within the Citizens Radio Service is already intolerably high. If existing rules permitting this use remain in effect, significant increases in usable spectrum must be made available to accommodate the most conservative estimates of growth. If public radio services developed to meet demand, their spectrum requirement might well dwarf even that of land mobile radio services.

Microwave Radio Relay -- This service provides the bulk of the long-haul transmission capability of the common carrier network as well as of numerous private services. Its annual growth rate, which ran to over 15% throughout the 1950-60 period, has declined in recent years to 7% in 1967. This decline is due to several factors, including spectrum scarcity near major urban areas where routes converge, and the declining cost of coaxial cable facilities which provide an alternative to radio services. The future is somewhat uncertain. The Bell System expects that by 1980 only 10% of its bulk transmission requirements will be met by radio relay, with the remaining 90% met by cable or other non-radiating alternatives.

Were adequate spectrum resources available to permit full exploitation of microwave economies of scale, the future pattern of development might be substantially different.

Communication Satellite Services -- In our chapter on domestic satellites, we discussed the technical feasibility and economic viability of satellites vis-a-vis various terrestrial alternatives. Satellite systems require a relatively high initial fixed investment regardless of the level of system capacity, while the additional cost to increase capacity is low in comparison to fixed costs. Therefore, the bandwidth available to each satellite, the location of this bandwidth within the overall spectrum range (e.g., above or below 10 GHz) and the nature of sharing constraints imposed, as functional limitation upon total capacity, have a marked effect on system economies. Prospects for such services are therefore quite dependent on the spectrum sharing and/or allocation approach that is adopted.

The pervasive general problem in the above areas is that -- with some exceptions -- the demand and technology for economical radio services requiring spectrum use are growing at a very fast rate, while new spectrum resources are not becoming available nearly so rapidly. As noted earlier, authorized non-government radio transmitters of all types in the United States already exceed 6 million -- a threefold increase since 1960. By 1980, assuming that demand can be accommodated, this number is conservatively projected to reach 17 million. */ Should usage by the general public grow as rapidly as we believe possible, the number could easily reach 50 million or more. Since spectrum use has been termed a "silent crisis" **/ and "spectrum congestion" and "spectrum saturation" have become everyday words in the telecommunications vocabulary, even conservative estimates of future demand will pose a serious challenge for spectrum management.

III. PRESENT-DAY MANAGEMENT APPROACHES AND CAPABILITIES ARE NOT ADEQUATE TO ACHIEVE OPTIMUM USE OF THE SPECTRUM

Existing capability for spectrum management is based on administrative simplicity and the needs of an earlier era.

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*/ DTM, op. cit. p. D-27

**/ Department of Commerce Technical Advisory Board, Electromagnetic Spectrum Utilization -- The Silent Crisis, 1966.

It is designed primarily to accommodate those radio services inherently worldwide in scope (e.g., services using frequencies below about 100 MHz); to deal with broad classes of spectrum use rather than with individual uses; and to minimize the expense of spectrum management. Thus, spectrum resources are apportioned among potential users according to a single nationwide "block" allocation plan. Priorities for spectrum access are established by this plan on the basis of the user category in which a given claimant falls. Spectrum resources are also divided between government and non-government uses on a nationwide block basis, largely irrespective of geographic variations in relative need. The amount of spectrum allocated to a particular service is controlled primarily by broad nationwide standards rather than the dynamics of spectrum demand in particular areas.

Until recently, this approach has by and large accommodated essential spectrum needs of the nation, and perhaps minimized government expenditures for spectrum management. But it has serious deficiencies for the immediate future and beyond:

-- Police and other public safety radio services in major metropolitan areas may be unable to obtain vital spectrum resources, while those resources allocated to other user categories go unused in the same area (e.g., frequencies reserved for forestry services were only recently made available to the New York City Police Department).

-- The business community and the general public throughout the nation may be denied access to otherwise unused spectrum bands, simply because these bands are used for other services in a few metropolitan centers (e.g., land mobile services are unable to use spectrum allocated to television in areas where these allocations are unusable for TV).

-- One class of users may be forced to adopt costly equipment modifications to meet growing demand, while another class, favored with an abundance of similar spectrum resources, may use them wastefully (e.g., private land mobile users have undertaken three major equipment revisions since 1950 to conserve spectrum, while certain other mobile services continue to use wider bandwidths than required by existing technology.

-- New spectrum dependent services, irrespective of potential social or economic benefit, may be denied allocations or forced to adopt uneconomic design and operating practices to protect established services, without even the option to indemnify existing users against harmful interference (e.g., satellite services are forced to locate earth terminals in remote areas and to adopt sub-optimum system trade-offs and operating constraints to ensure absolute interference protection for microwave relay systems).

Within the limitations of staff and funding -- and the dual system of management under which they must operate -- the FCC and DTM have attempted in recent years to coordinate efforts and eliminate these deficiencies.*/ Certain steps recently begun, if carried to fruition, will afford temporary relief from some of the most urgent of these problems.*/ However laudatory, these efforts serve only to highlight the need for an improved spectrum management capability which will, systematically and expeditiously, make spectrum resources available to meet growth in demand and variations in social, geographic and economic benefits.

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*/ DTM, op. cit., pp. E 1-29

A. National "Block" Allocation Procedures Lack Adequate Flexibility

The opportunity to use spectrum has historically been allocated among various groups and types of service according to a uniform national plan in which particular spectrum bands are earmarked for use by a particular category of user and/or service. The spectrum band allocated for the petroleum industry is the same in New York City as in the Texas oil fields, as are those allocated for taxicabs, maritime radio, police forces, etc. Similarly, spectrum allocated to television broadcasting bands, as distinguished from discrete channel assignments, is uniform in all areas of the country. Yet, in every area of the country portions of these bands lie idle and unassignable to discrete television channels because of existing intraservice interference standards. In New York City alone, the FCC Land Mobile Frequency Relief Committee reports that some 84 MHz*/ of spectrum lies fallow and unused for this reason. While unusable for TV, many of these frequencies would be quite suitable for other services without jeopardizing television reception. Meanwhile, spectrum available to land mobile users, including critical public safety services, is experiencing intolerable congestion in that city.

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*/ FCC Dockets 18261 and 18262 seek to determine whether certain unused UHF television channels (i.e., the lower 7) could be shared by land mobile services in selected geographic areas, and whether other channels at the upper end of the UHF television allocations might be reallocated to land mobile service in a separate action. The DTM released 26 MHz of spectrum formerly allocated to government use to enable the FCC to meet urgent needs.

When spectrum resources were abundant, advantages of nationwide block allocations, such as administrative simplicity and equipment standardization, may have outweighed the disadvantages. However, the sharp rise in demand for spectrum use combined with finite limits upon usable spectrum clearly requires that local variations in demand among various user and service categories be considered in apportioning spectrum resources. To be sure, the existing spectrum management structure has occasionally responded to such needs on an *ad hoc* basis in selective geographic areas. But those steps have usually involved lengthy administrative negotiation and coordination. Flexibility must become the rule rather than the exception if we are to achieve effective use of the spectrum. Of course, we must be mindful of imbedded capital investment in existing equipment. Before any changes invoking equipment obsolescence, reasonable periods of amortization should be afforded.

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*/ This is twice as much spectrum as is now allocated to land mobile services in the city.

B. Existing Criteria for Apportioning Spectrum Resources Among Competing Uses are Unsatisfactory

Under existing law and policy, the only criterion available to the spectrum manager for resolving conflicting claims is "the public interest, convenience or necessity." The product of an earlier era, that standard is neither sufficiently objective nor definitive to resolve the questions of spectrum access we now confront. In establishing the initial block allocations to user groups and services, the FCC relies primarily on the claims of competing interest groups and its own projections of potential need. Once established, the initial block allocations carry great weight; and thereafter integrity of the allocation, rather than flexibility to meet spectrum demand, tends to become the central concern.

When inflexible priorities are assigned on the basis of claims by institutional user groups, distortions are very likely to occur. Criteria for establishing priorities and comparing relative values are not likely to be applied consistently to differing claimants. Not forced to consider the value of spectrum to others, each group has every incentive to exaggerate its own needs. If one anticipates he will receive less than he asks for, he has all the more reason to inflate his demands. Accordingly, great latitude exists for sub-optimal allocation and use.

C. The Division of Spectrum Resources and Management Responsibilities between Government and Non-Government Uses is a Source of Inefficiency

Another characteristic of the national block allocation scheme is the division of spectrum resources between government and non-government uses. And, just as the resource is rigidly partitioned between government and non-government use, the responsibility for management of each portion is also divided. Under the 1934 Communications Act the FCC administers all non-Federal Government use of spectrum. Responsibility for assigning frequencies to Federal Government stations is vested in the President. By delegation of authority from the President, the Director of Telecommunications Management discharges that responsibility. The Interdepartment Radio Advisory Committee (IRAC), composed of representatives of the principal Federal Government users of radio frequencies, plays an important role in the actual determinations. While formally represented on only the Frequency Assignment Subcommittee of the IRAC, the FCC maintains close liaison with the IRAC.

Once spectrum is partitioned between government and non-government uses, responsibility for allocating each portion is clearly defined. But, in prospective, there is no formal mechanism for resolving conflicting claims between government and non-government uses. By the same token, no formal mechanism exists for resolving ultimate differences between DTM, representing Executive Branch users, and the FCC, representing private users. The President and the FCC are, in effect, independent within their respective spheres.

To be sure, mechanisms have been developed to avoid interference between the two sectors, and to accommodate critical government needs. But the division of responsibility has inherent problems. For example, certain government spectrum resources go largely unused in those urban areas where civilian spectrum needs are greatest. The government may well need as much spectrum space as it has in some areas of the country -- indeed, in some areas it may need more. But more relevantly, what are the requirements for spectrum use by government agencies in specific urban areas? How much of this is contingency need, and how might the total spectrum resources of each area be better utilized if more flexible arrangements were established for government/non-government sharing at the local level? These are questions which no single agency can resolve under the present scheme of divided responsibility.

D. Spectrum Waste is a Significant Problem

By "spectrum waste" we refer to such factors as the use of broader bandwidths or higher power than required or antennas of less directivity than the service area would dictate; and to the use of receivers having less sensitivity and/or selectivity than current technology can economically provide. To avoid interference in such cases, greater separation (in geography and/or spectrum location) of spectrum uses must be maintained.

With present management procedures and resources, a major factor contributing to spectrum waste is the inability to engineer spectrum uses on an individual basis. The block allocation system is protected by nationwide standards dictating maximum bandwidth, power, antenna height, and other factors affecting each service. These standards are not adaptable to variations in need and location. Since the spectrum user faces no direct economic penalty for waste, it is often less expensive for him to comply with only the broadest standards than to tailor his equipment and operating practices more nearly to his specific requirements.

E. The Present Levels of Staff and Funding Devoted to Spectrum Management are Inadequate

The FCC's spectrum management responsibilities alone have reached staggering proportions. More than 800,000 license applications were received for processing in 1967. Unable to obtain necessary funds for enlarging its small technical staff, the FCC cannot adequately undertake the comprehensive planning needed to achieve greater efficiency in spectrum use. It has little alternative but (a) to rely on block allocations, (b) to establish simplified operating standards for use of frequencies, and (c) except for broadcasting, to issue licenses and renewals on a routine basis to qualified applicants.

Much of the technical work essential to the success of FCC licensing is done privately rather than by the FCC's engineering staff. Thus, within land mobile and other bands, the task of minimizing interference through coordinating new applications with existing assignments has been relegated to private user associations. Much of the monitoring activity necessary to trace harmful interference to its source must be done directly by the affected parties, rather than by FCC engineers. While such private activities will continue to be indispensable to good spectrum management and engineering, the spectrum management authority clearly requires adequate engineering and analytic capabilities to establish and continually improve technical standards and to independently evaluate allocation and interference issues which arise among users.

The process of apportioning spectrum use among government agencies is less difficult than that used by the FCC, with somewhat greater attention to individual uses. However, the growing volume of applications (now 37,000 per year) has made it increasingly difficult for the DTM to conduct detailed analyses of individual applications. A growing tendency toward use of allocation tables and other methods of routinization is the result.

IV. CLEAR POLICY OBJECTIVES AND A NEW APPROACH TO SPECTRUM MANAGEMENT SHOULD BE ADOPTED

A. A Basic Guide is Needed for Spectrum Use and Management

A lack of clear national policy objectives has been cited by the Director of Telecommunications Management and others as a major deterrent to more effective spectrum use. Fundamental public policy regarding the spectrum should be to seek that combination of spectrum uses which offers maximum social and economic contribution to the national welfare and security.

This guideline emphasizes our concern with maximizing the efficient use of spectrum resources. A particular spectrum use should not be favored if its potential contribution to net social and economic welfare is less than a competing use. Such comparisons require that all costs and benefits (including imbedded capital investments) be taken into account. Interference with other uses by a particular use is a major factor in judging its contribution to net social and economic welfare. The combination of all spectrum uses should be the focus of public policy, rather than some selected few. Thus, one corollary of the basic guideline is to seek the continuing substitution *of higher-valued spectrum uses for lower-valued uses -- and the addition of uses whose net effect is to increase overall social or economic benefits -- with due consideration of all imbedded capital investments*.

The spectrum is not subject to depletion through use. It may be converted to new uses on demand. Thus, greater benefits will normally accrue from making spectrum available for productive use when and as required, rather than "banking" it for possible future uses. Some "banking" may be desirable as an incentive for the economical development of equipment and services, or indeed to preserve for future development some spectrum free from substantial user-investment which would be difficult or impossible to overturn. But this should be permitted only as an adjunct to broad, long-range planning guides. It should not include anticipatory allocation of spectrum rights to particular users in the absence of a clearly foreseeable need. As a second corollary to the basic guideline, *unused spectrum resources should be employed to meet any legitimate need provided that this does not cause excessive interference to existing uses, conforms with established standards and* international agreements, and does not interfere with established plans for higher-valued uses.

In our economy, most scarce resources are allotted through a free market of buyers and sellers. The market mechanism is attractive because it encourages transfer of resources from lower-valued to higher-valued uses. A willingness to buy and sell at a price, rather than administrative priorities, establishes value. Thus buyers are stimulated to conserve a resource when cost is incurred in its use.

One of the first concepts we explored in our spectrum study was the potential of market mechanisms to allocate spectrum efficiently. We examined such issues as: the extent to which social values of spectrum use (i.e., those values not fairly reflected by market dynamics) could be properly taken into account in a market allocation system; the problem of defining rights in spectrum use that would be adaptable to free market exchange without leading to inefficient use of spectrum; and the problem of protecting rights and resolving disputes between rights holders.

As discussed later, we conclude that greater emphasis be placed on economic factors in allocating spectrum resources among competing claimants. We further believe that the most effective means for reflecting economic value is through the direct interplay of buyer and seller. However, we cannot at this time recommend adoption of a full-scale free market mechanism for spectrum use. The most basic problem is of identifying spectrum rights suitable for unrestricted trading, which at the same time would not result in great waste of spectrum resources.

If a free market is to operate effectively, the rights exchanged must be reasonably distinct, quantifiable, and divisible, and without strong interaction between uses. These features would permit the resource to be transferred easily from one use to another, and for segments to be subdivided or consolidated in accordance with variations in supply and demand.

The spectrum possesses several special characteristics which, while contributing immensely to its ability to support telecommunications, makes quite complex the definition of rights, in workable, quantitative terms. First, the spectrum is not depleted through use -- as are resources such as coal, oil, minerals, etc. -- but remains ever available for further use. Second, the use of a particular "part" of the spectrum for one radio service does not necessarily deny use of the same "part" to another service, either simultaneously or appropriately phased in time, either in the same or a different geographic area.

Third, while radiation characteristics can be well defined in terms of energy, bandwidth occupancy, and time, the spatial distribution of energy cannot be confined within discrete boundaries at all times, except in a probabilistic sense, because of the nature of radio waves and the effects of earth-atmosphere environment. Interference with another user, whether in the same frequency band or as a result of interaction in any other frequency band, may also be predicted or controlled only in a probabilistic sense. Though spectrum uses may to some degree be considered diffuse and overlapping, technical means used at the transmitter and receiver can control such overlap and interaction. Almost any degree of protection may be achieved at some cost, between potentially interfering uses. Indeed, the incentive to balance the cost of protection against the cost of spectrum use underlies the attraction of the market system to achieve efficient utilization.

Because of these characteristics, spectrum uses interact with one another in complex, variable, and potentially harmful ways, even though much duplication is technically possible in the use of each part of the spectrum. Thus, the ability of one user to employ a particular spectrum right can be greatly affected by how others employ their rights. Yet every approach we have examined for coping with this problem of "externalities" -- by identifying sufficiently discrete and unique spectrum rights to permit them to be freely exchanged, subdivided, or combined -- carries the prospect of significant overall inefficiency in the use of the spectrum.

We have concluded, first, that further study of the question of definition of rights, with due regard to rapidly changing technology, is clearly essential before a full-scale market system could be employed. The understanding of the resource, and its measure, which would come from such a study is important to any scheme for frequency management. Second, the most effective allocation of the spectrum is so complex a technical, social and economic problem that it requires centralized coordination if important interactions that accompany spectrum use are to be taken adequately into account. Thus, an additional principle of spectrum management is that comprehensive coordination of all spectrum use is required under a continuing framework of public administration.

B. Greater Consideration of Economic Factors is Necessary

Use of the spectrum should be subject to more direct economic forces in the future rather than being treated as a free right. It is of real economic value to the user which should be fairly reflected in allocation of the resource. Moreover, the government incurs significant expenditures in managing the spectrum and making it available for use. The direct beneficiaries should be called upon to bear a fair share of those costs. Economic incentives would also encourage users to apply their innovative skills toward more efficient spectrum use.

Since a full-scale market system would entail potentially serious problems, requiring further study as mentioned above, the means of bringing economic forces to bear are somewhat limited. Of the approaches we have examined, the use of license fees which bear a reasonable relation to the amount of spectrum used or potentially denied to other users and to the demand for spectrum use within the area is attractive.

Because of the difficulty of establishing an initial schedule of fees which would fairly reflect relative values of spectrum use, at the outset they should be set at relatively low levels, though in reasonable proportion to the amount of spectrum use (e.g., bandwidth, power, and other indicators).

This would serve several purposes: (a) provide a source of revenues to cover the cost of an expanded spectrum management service; (b) discourage use of the spectrum by those whose needs or motivation are truly marginal; and (c) provide a clearer indication, through analysis of the license applications, of the actual demand for spectrum use as a function of service category, geographic location, and fee schedule. Later, the fee schedule and service allocations could be adjusted periodically as a quasi-market mechanism to reflect relative demands for spectrum use. Before moving to this second stage, however, detailed studies investigating the administrative feasibility and the economic and social impact of an adjustable fee system for spectrum licenses will be required.

Other direct economic incentives may also be effective. For example, the right to transfer licenses between users should encourage increasing substitution of higher for lower-valued uses. Under present practices, transfers are permitted only between users within a specific sub-allocation (e.g., taxicab services). We find neither technical nor operational justification for most sub-allocations within a given type of service (e.g., land mobile). Therefore, consistent with other regulatory policy considerations, license transfer should be permitted across as wide a range of users as is technically and operationally feasible.

Many trade-offs exist between equipment cost and reduction in interference between users -- an especially important factor in considering the needs of "clear channel" use, as in commercial broadcasting and point-to-point services, where very little interference can be tolerated. Among other things, special equipment can be installed at one antenna site to cancel certain kinds of interference emanating from another site. Quite conceivably, the added cost to the prospective user of reducing interference to the existing user to a tolerably low level would be less than the social value gained by conserving the spectrum through greater shared use. In such cases, society would benefit by permitting expanded shared use in combination with a procedure with which the cost of adding protection from interference would be appropriately borne.

Therefore, we recommend several steps to bring stronger economic forces into play:

1. An improved schedule of fees for spectrum licenses should be developed which reflects the extent of spectrum use (e.g., bandwidth, power, service area, time availability) and the level of demand for spectrum access. And intensive studies should be conducted of other means to account for economic value, including adjustable license fees, spectrum leasing, and taxation.

2. License privileges should be clearly stated for each class of spectrum use (e.g., land mobile, radio relay, etc.) in terms of channel loading, interference probability, service quality, and other appropriate factors.

3. Administrative procedures should be modified to permit greater transferability of licenses among legitimate spectrum users within broad service classifications, subject to all relevant conditions of the initial license,

including the requirement that all exchanges or transfers be registered and approved by the spectrum management authority.

4. Procedures should be developed whereby a prospective spectrum user may obtain a license even though this would represent a potential source of harmful interference to an established clear channel user, provided that prior arrangements are concluded between all affected parties, including adequate compensation or indemnification by the new user.

C. Greater Attention to Individual Spectrum Uses Should be Achieved Through "Spectrum Engineering" and Related Technical Considerations

In the previous section we described steps for introducing stronger economic incentives into the spectrum management process. As a vital complement, continuing improvement will be needed in standards for the design and operation of transmitters, receivers, and antennas. Indeed, these standards will take on increased significance as demand and technology advance. Technological advances affecting spectrum use are so rapid that new, more efficient systems often cost no more to use than facilities developed in an earlier technological era. Only through continuing --

but selective -- updating of technical standards (with appropriate protection for past investments) are obsolete equipment and operating practices likely to be abandoned as early as is justified in the overall national interest.

The Joint Technical Advisory Committee (JTAC) of the Institute of Electrical and Electronic Engineers (IEEE) and the Electronic Industries Association (EIA) recently completed a study of the engineering problems associated with spectrum use. A source of much valuable information, this study recommends a "next generation" approach to spectrum engineering which focuses upon individual use rather than broadly [illegible] standards. We agree with the basic principle of individualized planning and engineering of spectrum uses to achieve greater overall benefits from the spectrum. However, an expanded program of spectrum engineering would entail a cost for monitoring and for such modifications as redesigned antennas and improved transmission techniques to meet more stringent standards. This cost could, at some point, exceed the value to society from increased spectrum use. Therefore, the spectrum engineering approach must be suitably modified to incorporate the economic considerations treated above.

Accordingly, we recommend that:

1. A more flexible approach to spectrum management should be adopted, under which the National Table of Frequency Allocations is transformed over time from a fixed allocation by user category to a basic planning guide by service classification.

2. A comprehensive spectrum engineering capability for individualized planning and engineering of spectrum uses should be developed, charged with continuing improvement in technical design and operating standards for all transmitting and receiving equipment and other devices that materially affect use of the spectrum.

V. THE ABOVE FINDINGS HIGHLIGHT THE NEED FOR ACTION IN SELECTED PROBLEM AREAS

A. Land Mobile Radio Services

Present policy affecting the VHF and lower UHF region of the spectrum (30-1000 MHz), that portion most useful for mobile radio and broadcasting services, has generated widely-voiced concern about the inadequacy of spectrum to meet growing demand. We have already discussed the spiraling demand for land mobile channels. Land mobile groups cannot fairly be asked to achieve more intensive use of presently allocated spectrum space while major blocks of spectrum allocated to -- but unusable by -- UHF television broadcasting lie idle, when these spectrum resources could meet land mobile needs without interfering with the present operations or growth of television broadcasting. The FCC has recently undertaken steps to make part of these unusable spectrum bands available for land mobile use. This study should be broadened to cover all unusable allocations for possible use by all services now experiencing spectrum scarcity.

Additional spectrum made available in this manner should not, however, be employed inefficiently by land mobile services, for a new crisis could soon materialize. More stringent limitations on power, antenna height, modulation, and other technical parameters; greater use of common-user systems (including inter-station trunking when appropriate); and more explicit and varied channel-loading (i.e., time-sharing) criteria should be emphasized. User license fees should fairly reflect the varying service quality to be expected under different channel-loading criteria, as an incentive to economize on spectrum use.

B. Public Safety Radio Services

State and local public safety agencies now obtain spectrum allocations from the FCC, in competition with commercial interests, while federal public safety users (such as the National Guard, and the FBI) have access to the government spectrum allocations. This arrangement is not conducive to sound spectrum management. This arrangement appears to put local public safety forces at a disadvantage in obtaining frequency resources. The use of different bands hampers coordination of local and federal forces during major civil disturbances. Our studies indicate some federal spectrum allocations may be relatively unused or lightly loaded in major metropolitan areas; in many cases public safety users may be the best group to share these allocations.

At the same time, State and local public safety users should seek more efficient spectrum use and improved coordination. Establishing improved operating standards to provide greater sharing among public safety users, and the adoption of common-user systems wherever practical, should be a continuing goal.

C. Television Broadcasting

The basic allocation of spectrum for television broadcasting covers a large part (492 MHz or 50%) of the entire spectrum range between 30 and 1000 MHz -- the most useful frequency range for many broadcast and mobile communications services. As discussed more fully in our chapter on broadcasting, the existing allotment plan for television has reserved spectrum in that range for extensive additional growth in the number of over-the-air UHF-TV stations. For example, there are 84 assignable commercial UHF-TV channels in the top 100 markets which remain unapplied for. Continuing review by the FCC of the need for these assignable channels by the television industry is warranted. In the meantime, non-interfering use by other services of spectrum lying within the overall television broadcast allocation may be possible on a city-by-city basis, without reducing the number of assignable UHF-TV channels.

Taking a longer view, as other television distribution modes become available, it may be appropriate to reconsider the need in some geographic areas for broadcasting in the UHF spectrum bands. The technical and economic feasibility of providing television broadcasting in other frequency bands (particularly higher frequencies where multi-channel broadcast capabilities would be possible with greater prospects for geographic re-use) and of employing narrower bandwidths for television broadcasting to conserve spectrum should both be the subject of federal R&D in support of spectrum management.

D. Microwave Services (1000-10,000 MHz)

This region of the spectrum is generally useful for line-of-sight transmission. It is used mainly for various radar and radio-navigation services, point-to-point radio relay, and communication satellite services.

For radio relay systems several possibilities exist for more efficient spectrum use. Some of these are already being implemented (particularly by the domestic common carriers). Included are: use of new antenna designs which improve directivity and suppress undesired radiation, use of modulation techniques offering higher resistance to the effects of undesired radiation (noise and interference) and use of multiple, geographically separated sites (space diversity) for similar purposes. These steps should be encouraged and accelerated through improved equipment and operating standards applicable to all radio relay systems.

A much discussed issue involves satellite use of frequency bands below 10,000 MHz, and frequency sharing by satellite and terrestrial systems. Under the sharing criteria established by the ITU in 1963, no harmful interference between the international (INTELSAT) satellite system and existing radio relay systems has been detected. Some believe that the significant technical differences between international and domestic satellite systems may further reduce the likelihood of interference between domestic satellite and terrestrial systems. Operators of radio relay systems have expressed the opposite view, holding that an increasing number of earth stations in a domestic system, with greater inland dispersal of antennas, may create serious problems.

While concern over potential interference is real, a general consensus exists within the engineering community that, with coordinated planning, no substantial problems would stem from the siting of at least one domestic earth station in the vicinity of a major urban center (e.g., New York City) where radio relay routes are most congested.

The situation in smaller urban centers should be no more restrictive than this, and likely much less so.

A major uncertainty in the development of economical domestic satellite communications concerns the amount of suitable spectrum resources available for these services. Therefore, a thorough reevaluation should be undertaken of various alternatives for satellite/terrestrial sharing of spectrum bands below 10,000 MHz, including analyses of relative costs and benefits of those alternatives to both satellite and terrestrial systems. Spectrum sharing between satellite and terrestrial systems adds a significant third spatial dimension to spectrum use, resulting not in a division of available communications capability but rather a net increase in overall communications capability. The benefits of this net gain must be carefully weighed against any loss in service quality or reliability which might result from potential interference between such uses.

Finally, there is the question of spectrum and orbital sharing among satellite systems themselves. Four major spectrum bands (and several minor ones) below 10,000 MHz are allocated to satellite use on a shared basis with radio relay services. The 7 and 8 GHz bands are authorized in the U.S. for government use on an interim basis, while the 4 and 6 GHz bands have been similarly designated for non-government uses. There are various possibilities for more efficient sharing of these allocations among government and non-government uses, including the use of orbital location and/or reverse spectrum assignments to avoid inter-system interference. For example, one system might use specific allocations in one direction (e.g., 6 or 8 GHz uplink and 4 or 7 GHz downlink); while another system used these same allocations in reverse directions (i.e., 4 or 7 GHz uplink, 6 or 8 GHz downlink). Such possibilities merit thorough evaluation, since they may also increase the total communications capacity from a particular frequency range.

E. Millimeter Wave Services (above 10,000 MHz)

The potential communications capacity of the spectrum regions above 10,000 MHz greatly exceeds the capacity of the lower bands, but their use is restricted by their fundamental propagation characteristics and by a lack of reliable, economic equipment at the present time. Some have nonetheless suggested that segments of this spectrum range should be used for domestic satellite service on an exclusive basis, as a way to avoid interference between satellite and terrestrial systems. However, satellite communications equipment capable of using these spectrum bands has not yet been developed, and energy losses due to atmospheric absorption -- known to be a factor of increasing importance as operations are extended above 10,000 MHz -- may render the use of these bands considerably less economical than those below 10,000 MHz for some services. This could be a particularly severe problem for satellite services which penetrate the atmosphere and require wide-area, continuous coverage -- such as television distribution, and mobile services.

Notwithstanding these difficulties, potentially attractive applications for use of the millimeter wave bands may arise, not only for satellites but also for terrestrial radio relay systems, multiple-channel television broadcasting and distribution, and mobile radio services.

We currently lack an adequate base of technical, economic, and operational data to plan the optimum use of these bands. Domestic allocation of these bands on an exclusive basis today could well foreclose attractive options which cannot now be adequately foreseen.

F. Scientific Uses of the Spectrum

Throughout the electromagnetic spectrum there are frequency bands of particular value for scientific research. Radio astronomy, for example, includes observations in the vicinity of characteristic emission and absorption frequencies for certain highly significant atoms and molecules which may be found in widely dispersed regions of the spectrum. Such research involves passive monitoring of very low signal levels and requires essentially clear-channel operation free from man-made interference. Moreover, scientific research is required in some small fraction of every major frequency band (e.g., HF, VHF, UHF and so on) to evaluate the propagation characteristics in these bands. The policy of providing reasonable interference protection for appropriate requirements of research -- particularly in those geographical areas where such research is conducted -- is clearly in the public interest and should be continued.

VI. ENHANCED MANAGEMENT CAPABILITIES AND A RESTRUCTURING OF RESPONSIBILITY AND AUTHORITY ARE REQUIRED

The challenges we foresee and the goals we have suggested demand a vigorous, flexible administrative mechanism, emphasizing productive use -- not restrictive conservation -- of the spectrum. The spectrum should be managed as the valuable resource it is, instead of being relegated in importance to a broad range of regulatory and other policy interests. In particular, the spectrum management function should not be used as a convenient regulatory tool in the pursuit of a variety of objectives other than achieving the maximum social and economic benefit from spectrum uses.

Reform is required in "block" allocations, in developing more objective criteria for apportionment of spectrum resources, in dividing spectrum resources between government and non-government uses, in conducting a co-ordinated program of R&D designed to produce better use both intensively and extensively of spectrum resources, and in reducing non-productive spectrum waste. Such reform should embody greater reliance on economic incentives, as well as improved engineering and should include more flexible and comprehensive administrative procedures.

We doubt the feasibility of such a program within the existing institutional framework of divided responsibility for spectrum management. We are persuaded that a single spectrum manager must be established within the Executive Branch if significant improvement in management is to be achieved.

The weakness of past management practices is evidenced by the large amount of usable spectrum lying fallow under the present scheme of exclusive nationwide allocation of bands of frequencies to specific user categories. As the relative disparity of uses varies between different geographic areas, waste results. With a single manager trying to maximize the use-value of the spectrum, this condition would be less likely to exist under the pressure of growing demand.

While at one time there may have been reason to separate the management of that portion of the spectrum assigned to the Federal Government from that used by all others, the present and future environment of scarcity dictates a different approach. The fact that a certain frequency band has been assigned to the Federal Government -- or to a particular non-government user category -- is no reason to leave it unused in geographic areas where it may be productively employed.

In addition to geographic location, other factors can be enlisted to achieve multiple use of spectrum. For example: time sharing, antenna directivity, variation of tolerable interference levels among different services, and more can, under proper management, be usefully exploited.

Under the weight of increasing demands, spectrum management will increasingly become more complex. To keep pace, the manager must constantly exert effort not only to improve existing tools, but to develop new ones along the lines discussed above. Separate government and civil management responsibilites are likely to blunt the effectiveness of this effort.

Every significant study of the spectrum problem in the past several years has emphasized that the Federal Government does not have adequate technical and economic information on which to base valid judgments affecting allocation and utilization of the spectrum. The adequacy of institutional arrangements to assure continuing availability of such information has been frequently questioned.

There is presently no single government program for comprehensive planning and coordination of spectrum uses at the local level, although the FCC and DTM have recently proposed a pilot project of this type for the Los Angeles area.*/ Moreover, available resources and present levels of personnel render any attempt at such a large-scale program wholly impractical. The economic, engineering, and administrative reforms discussed above will require in the near future a substantial increase in resources and capabilities, whatever the organizational structure. Unified action is necessary particularly in establishing a common data base for radio frequency management and in developing standardized management techniques.

The longer the present management structure remains, the greater the likelihood that considerable duplication and inefficiency will result. Establishing a single manager should reduce these problems significantly: It would facilitate establishment of (a) common data collection programs, (b) common bases for projecting demands and services and for developing, implementing, and enforcing equipment and operating standards, (c) a single spectrum engineering capability for both government and non-government uses, and (d) a consistent system of priorities derived from a common base.

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*/ The FCC and DTM would establish joint field offices in the Los Angeles area, with computer support at their central offices, to investigate the feasibility of applying improved engineering techniques rather than block allocations in making certain frequency assignments.

A single management would also facilitate the introduction of flexible administrative procedures -- including a reduction in the number of lengthy proceedings and interagency negotiations -- essential to effective management with rapid accommodation to individual needs, and coordination of interacting uses of the spectrum.

A consolidation would make possible more efficient use of technical and analytic capabilities now fragmented among various offices. It would provide a framework for coordination and a strengthened, mission-oriented approach to spectrum research now carried out in certain government laboratories. It would also provide a focal point for coordination with industrial and academic research activities. This should lead to an improved capability for establishing and enforcing the technical standards and licensing requirements needed to prevent harmful interference among spectrum users, and for conducting the necessary long-range studies in spectrum management recommended earlier.

Unification of spectrum management within the Executive Branch would also relieve the FCC of complex managerial tasks which (subject to qualifications noted below) need not be tied to its regulatory responsibilities. It would subject federal usage claims to scrutiny by an agency charged also with protecting non-federal interests in spectrum use. It would enhance the ability to plan and implement Presidential control of communications in times of national emergency, which is today handicapped by divided responsibility. And it would provide more effective U.S. participation in international telecommunication conferences and related activities.

In sum, we see substantial benefits on all sides from consolidated spectrum management functions. The management structure and operations would benefit by eliminating duplicate offices, personnel, research facilities, data collection and analysis facilities, and other resources; this increased efficiency would result in more comprehensive and sorely needed management capabilities. Private users would benefit from this improved management capability, because more spectrum resources could be made available within virtually every area of use. Government users would likewise benefit in those areas where their needs are greatest, and should incur little or no loss in communications capability in any area. Finally, the public would benefit from the increased spectrum resources made available for both public and private use, in terms of added services and/or reduced rates.

One argument advanced against unification is that an agency such as the Department of Defense, given its vital role of national security, should not be subordinated to a separate authority dealing with both public and private claimants for spectrum. But the national security of the U.S. depends on many resources other than spectrum. Government agencies experience little difficulty obtaining other resources through normal procedures, whether by purchase or expropriation. There is no reason to suppose that acquisition of spectrum rights would pose any greater difficulty.

It has also been suggested that unification of spectrum management would encroach upon the FCC's exercise of regulatory responsibilities in broadcasting and common carrier services. This argument is predicated on the notion that spectrum allocation and assignment is a fundamental determinant of the structure and performance of these sectors, and therefore cannot be separated from FCC's broadcast licensing and common carrier regulatory role. However, after careful analysis, we have concluded that this concern is not well founded.

The FCC's responsibilities in the field of broadcasting, such as determining the proper number, location, and qualifications of broadcast entities and regulating their operations, are quite distinct from responsibilities for managing use of the spectrum. While policies underlying these functions may occasionally conflict or overlap, the crucial fact is they represent distinctly separate activities which can properly be performed by different agencies.

An Executive Branch spectrum manager and the FCC should encounter no major obstacles in working out together (under the watchful eye of Congress) any needed changes in the existing broadcast station allotment plan */

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*/ 47 CFR, Part 73606

which would appropriately reflect the objectives of both agencies. We have no reason to expect that disagreement would frequently arise on the need for such changes given (a) the present stage of broadcast development, (b) the present station allotment plan (essentially unchanged for over 15 years), (c) the recognition by the FCC in recent proceedings of the potential benefits of releasing certain unused portions of the UHF broadcast band to other services, and (d) the unlikely prospect of any major modifications to the existing allotment plan in the near term. The Commission would continue to license broadcast stations, according to the existing station allotment plan.

Infrequently, conflict might arise between two broad policy interests, e.g., between national security and promotion of broadcasting or between broadcasting policy and efficient spectrum use. [*] The legislation establishing a single spectrum manager could provide suitable guidance for such eventualities. For example, it could make clear that the spectrum manager coordinates questions having a major bearing upon the nation's security or welfare with other appropriate agencies of government. And in the infrequent instances where irreconcilable conflict based on the interplay between such broad mandates did arise, it seems only proper that the competing considerations be brought to Congressional attention.

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[*] Such a conflict, in theory, already exists under the present division, and might well arise between any two agencies charged with mandates which at some point interrelate.

Similarly, accommodation between FCC responsibilities and those of the spectrum manager seems feasible in the area of common carrier services, where considerations relevant to the grant of frequencies are more technical and economic -- in contrast to the range of sensitive and heavily value-oriented issues involved in broadcasting. The division of responsibility for allocating a resource among claimants, and for regulating the behavior of firms in an industry, has worked successfully in other areas. There seems little reason to expect a significant divergence in this area between the objectives of the FCC and the spectrum manager. In developing the statutory framework for an improved spectrum management authority, appropriate provisions should be incorporated to ensure that (a) in the case of the common carriers, proposed investments in facilities would require FCC approval on regulatory grounds, and (b) in the case of private applicants for licenses, the proposed use would have to be consistent with FCC regulatory rules relating to competition with common carrier services. Whatever the statutory mechanism chosen, a Commission decision based on regulatory grounds would have full effect, exactly as under today's procedures.

With respect to services usually outside the scope of FCC regulation of broadcasting and common carrier services, e.g., safety and special services, social values as well as technical and economic considerations may be involved in determining spectrum use. However, unlike the broadcasting and common carrier fields, no special considerations require that responsibility for making such determinations be lodged in the Commission.

As a final consideration, we note that the Commission is headed by seven Commissioners and operates as an independent agency with quasi-judicial procedures -- quite appropriate in view of the important and sensitive judgments it must make among applicants competing for broadcast licenses (and, to a lesser extent, in formulating rules to govern the performance of broadcasters and common carriers). But neither in its structure nor in its procedures is the Commission equipped to ensure efficient spectrum management. The need for comprehensive planning, rapid response to changing conditions, and close co-ordination with a variety of government R&D efforts and policies entrusted to other Executive agencies suggest an Executive capability in spectrum management separated from the regulatory functions of the FCC. Accordingly, we conclude that:

1. Legislation should be considered which would vest in an Executive Branch agency overall responsibility for efficient spectrum use for all government and non-government uses. This legislation should contain appropriate guidance as to coordination between the spectrum manager and the FCC in areas of mutual interest and concern.

2. The agency should be given the resources needed to develop a strong interdisciplinary capability embracing technical, economic, social, and legal skills,

to support its spectrum planning, management, and coordination responsibilities as described in this Report.

3. The agency should: (a) determine and continually update the division of spectrum among various classes of users, and administer its use on the basis of detailed planning and engineering at local and national levels; (b) establish and enforce technical standards applicable to all transmitting and receiving equipment and other devices that materially affect the use of spectrum; (c) coordinate federal R&D activities oriented toward spectrum management and use, except those directed to fulfill a specific mission of another agency; and (d) administer any user fee systems now existing or later established.

4. In the interim, to meet existing spectrum management problems and to prepare for the future, resources should be provided to begin effectively to implement the general and specific recommendations of this report.

VII. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Clear policy objectives and a new approach to spectrum management should be adopted --

A. AS A BASIC GUIDELINE, WE SHOULD SEEK THAT COMBINATION OF SPECTRUM USES WHICH OFFER MAXIMUM SOCIAL AND ECONOMIC CONTRIBUTION TO THE NATIONAL WELFARE AND SECURITY.

Accordingly, the following principles emerge:

1. We should seek the continuing substitution of higher-valued spectrum uses for lower-valued uses and the addition of uses whose net effect is to increase overall benefits, with due consideration of all imbedded capital investments.

2. Unused spectrum resources should be employed to meet any legitimate need provided that this does not cause excessive interference to existing uses, conforms with established standards and international agreements, and does not interfere with established plans for higher-valued uses.

3. Comprehensive coordination of all spectrum use is required, under a continuing framework of public administration.

B. GREATER CONSIDERATION OF ECONOMIC FACTORS IS NECESSARY

1. An improved schedule of fees for spectrum licenses should be developed, which reflects the extent of spectrum use (e.g., bandwidth, power, service area, time availability) and the level of demand for spectrum rights. And intensive studies should be conducted of other means to account for economic value, including adjustable license fees, spectrum leasing, and taxation.

2. License privileges should clearly be stated for each class of spectrum use (e.g., land mobile, radio relay, etc.), in terms of interference probability, channel loading, service quality, and other appropriate factors.

Summary -

3. Administrative procedures should be modified to permit greater transferability of licenses among legitimate spectrum users within broad service classifications, subject to all relevant conditions of the initial license, including the requirement that all exchanges or transfers be registered and approved by the spectrum management authority.

4. Procedures should be developed whereby a prospective spectrum user may obtain a license even though this would represent a potential source of harmful interference to an established clear channel user, provided that prior arrangements are concluded between all affected parties, including adequate compensation or indemnification by the new user.

C. GREATER ATTENTION TO INDIVIDUAL SPECTRUM USES SHOULD BE ACHIEVED THROUGH "SPECTRUM ENGINEERING" AND RELATED TECHNICAL CONSIDERATIONS

1. A more flexible approach to spectrum management should be adopted, under which the National Table of Frequency Allocations is transformed over time from a fixed allocation by user category to a basic planning guide by service classification.

2. A comprehensive spectrum engineering capability for individualized planning and engineering of spectrum uses should be developed, charged with continuing improvement in technical design and operating standards for all transmitting and receiving equipment and other devices that materially affect spectrum use.

D. ENHANCED MANAGEMENT CAPABILITIES -- AND A RESTRUCTURING OF RESPONSIBILITY AND AUTHORITY -- ARE REQUIRED

1. Legislation should be considered which would vest in an Executive Branch agency overall responsibility for ensuring efficient spectrum use for all government and non-government uses; this legislation should contain appropriate guidance as to coordination required between the spectrum manager and the FCC in areas of mutual interest and concern.

2. The agency should be given the resources needed to develop a strong interdisciplinary capability embracing technical, economic, social, and legal skills, to support its spectrum planning, management, and coordination responsibilities as described in this Report.

3. In particular, the agency should: (a) determine and continually update the division of spectrum among various classes of users, and administer its use on the basis of detailed planning and engineering, at local and national levels; (b) establish and enforce technical standards applicable to all transmitting and receiving equipment and other devices that materially affect spectrum use; (c) coordinate federal R&D activities oriented toward spectrum management and use, except those directed to fulfill a specific mission of another agency; and (d) administer any user fee system now existing or later established.

4. In the interim, to meet existing spectrum management problems and to prepare for the future, resources should be provided to begin effectively to implement the general and specific recommendations of this report.

E. SPECIFIC RECOMMENDATIONS IN SELECTED PROBLEM AREAS

1. Land Mobile Radio Services.

a. Land mobile radio services should be authorized to use spectrum resources now within the national allocations for UHF television broadcasting which are unusable by television stations under the present TV station allotment plans; subject to operating criteria which will avoid harmful interference to television broadcasting on adjacent channels or in adjacent geographic areas.

b. Equipment and operating standards should be established for engineering future land mobile services to permit closer spacing of base stations sharing the same frequency assignment: the use of multi-channel radio equipment should be encouraged wherever this would economically provide more efficient spectrum use.

c. Development and use of common-user and common-carrier mobile radio systems -- including those employing wire-line trunking between individual base stations -- should be encouraged, particularly for users with intermittent service requirements.

d. A range of channel loading criteria should be established to encourage effective frequency sharing among complementary uses and to provide a satisfactory and well defined quality of service to each user.

e. The sub-allocation of land mobile spectrum bands by user class should be substantially discontinued. Any remaining sub-allocations should be flexibly administered within each geographic area.

f. Procedures should be established whereby members of the general public now restricted to the Citizens Radio classification may be licensed to use certain land mobile spectrum resources subject to compliance with reasonable technical and operating standards and appropriate channel-loading criteria.

2. Public Safety Radio Services.

    a. The public safety radio services, in particular, should be incorporated into the government spectrum allocation and management framework.

    b. Operating standards requiring greater time and geographic frequency sharing among public safety agencies should be established.

    c. Development of common-user mobile radio systems for public safety services should be encouraged.

3. Television Broadcasting.

    a. Spectrum resources presently allocated for broadcasting which are unusable for that purpose under existing station allotment plans should be made available for land mobile and other uses.

    b. Studies of improved techniques for television broadcasting should be carried out on a continuing basis, with respect to alternative distribution methods, channel bandwidth reductions, and reduction in total spectrum allocations.

4. Microwave Services (1000 - 10,000 MHz).

    A. Improved operating standards (e.g., modulation, antenna directivity, space diversity, etc.) should be established to achieve greater spectrum re-use and interference protection between terrestrial facilities sharing the same frequency ranges.

b. The criteria for satellite/terrestrial sharing of all spectrum allocations below 10,000 MHz should be re-evaluated, giving due consideration to the significant technical differences between domestic and international satellite systems and to improvement in technical data since the existing criteria were established.

c. Experimental programs should be conducted to ascertain the probability of interference between satellite earth stations and terrestrial radio relay stations, in shared frequency bands below 10,000 MHz.

d. Improved criteria and coordination procedures should be developed for efficient sharing of spectrum allocations and orbital locations among domestic and international satellite systems, both government and non-government.

5. Millimeter Wave Bands (above 10,000 MHz).

a. Continuing research and development activities needed to bring about effective and efficient use of these spectrum bands should be encouraged, through federal R&D programs and flexible policies with regard to the potential uses of these bands.

b. Existing domestic allocations of all millimeter-wave bands should be reviewed to determine the feasibility of inter-service sharing of these bands as an alternative to exclusive domestic allocations to satellite and terrestrial services.

CHAPTER NINE

THE ROLES OF THE FEDERAL GOVERNMENT IN TELECOMMUNICATIONS

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CHAPTER NINE

THE ROLES OF THE FEDERAL GOVERNMENT IN TELECOMMUNICATIONS

I. INTRODUCTION

This report has explored issues of national communications policy in a variety of settings. And our conclusions and recommendations embrace a wide range of actions. A few imply no change in the existing structure or activities of government in the telecommunications field; e.g., our suggestion that teleprocessing remain a non-regulated activity. Others explicitly entail organizational changes; e.g., a unification of the spectrum-management functions now performed separately by the Director of Telecommunications Management and the Federal Communications Commission. Still others strongly imply the need for government to improve its capabilities; e.g., the recommendation for the formation of a single U.S. international transmission entity subject to informed public regulation.

Specific organizational recommendations are beyond the scope of this report. We attempt, rather, to identify the implications of our policy recommendations for the role and general structure of the federal establishment, and thereby to furnish a new and useful perspective on our conclusions in specific substantive areas. In sum, we ask the questions: What are the appropriate roles of the Federal Government in relation to telecommunications? And to what extent do our policy recommendations call for changes in present federal activities?

II. TRADITIONALLY, GOVERNMENT HAS VIEWED TELECOMMUNICATIONS PRIMARILY AS A MISSION-SUPPORT FUNCTION, RATHER THAN A FOCUS FOR PUBLIC POLICY. THE RESULT HAS BEEN THAT POLICY HAS EVOLVED AS A PATCHWORK OF LIMITED, LARGELY AD HOC RESPONSES TO SPECIFIC ISSUES, RATHER THAN A COHESIVE FRAMEWORK FOR PLANNING. GOVERNMENT ORGANIZATION FOR THE FORMULATION AND IMPLEMENTATION OF COMMUNICATIONS POLICIES REFLECTS THIS EVOLUTION

A. Early Government Involvement in Telecommunications Often Involved Ad Hoc Responses to Individual Problems as They Appeared

The Federal Government's involvement in telecommunications dates back to the earliest days of telegraphy in the mid-nineteenth century, when the Post Office provided the first commercial telegraph service. Until the turn of the century, however, the government concerned itself with the industry only sporadically. Two steps taken early this century soon proved to be inadequate.

The Mann-Elkins Act of 1910 gave jurisdiction over interstate and foreign telephone and telegraph service to the Interstate Commerce Commission. The Commission soon found that it could not devote sufficient attention to what was rapidly becoming a major industry. The Radio Act of 1912, passed in part to protect certain radio frequencies for governmental use, proved unable in its simple scheme to cope with the problems caused in the 1920's by a tremendous growth in demand for radio communications from both government and non-government users.

In 1922, the Secretary of Commerce formed the Interdepartment Radio Advisory Committee (IRAC), composed of representatives from the various federal agencies that used radio communications, to allocate frequencies among the agencies in order to prevent harmful interference. In 1927, Congress established a five-member Federal Radio Commission empowered to classify, license and regulate non-government stations to prevent interference among them.

B. The Framework Established by the Communications Act of 1934, Although Combining the Broadcasting and Common Carrier Regulatory Functions, Remains Limited in Scope

The Communications Act of 1934 created a permanent, seven-man Federal Communications Commission as an independent agency with the regulatory powers over communications carriers that the Mann-Elkins Act had vested in the Interstate Commerce Commission and the licensing powers over radio communications that the Federal Radio Commission had enjoyed. But some gaps remained. As indicated in Chapter Six, these were later to create problems: carriers were not required to obtain Commission permission to raise new capital or to make additions to plant, other than the communications lines themselves; the Commission was given no direct authority over procurement of communications equipment or facilities by regulated carriers, over their affiliations with manufacturers of such equipment, or over inter-carrier contracts; nor was it given authority to approve mergers or consolidations of international telephone or telegraph carriers, should they be needed. The advent of cable television and computers, moreover, raised problems on which the Act provided little guidance.

The 1934 Act vested the FCC with sweeping powers (more fully described in Chapter Eight) over use of the radio spectrum by all entities (including state and local government) other than the Federal Government, plus some specific powers over broadcasters -- e.g., equal time for political candidates. Authority to assign frequencies to federal agencies, however, remained with the President. And no agency was empowered to resolve conflicts between federal and non-federal use of the spectrum or to optimize their combined uses.

Finally, the Communications Act of 1934 evinced little recognition of a federal role in communications beyond the duties assigned the FCC. Thus, consonant with the view of communications as primarily a government mission-support function, no agency was created to administer federal spectrum use, to coordinate federal research and development in telecommunications or the procurement of communications services and equipment by federal agencies, or otherwise to act as a focal point for the Executive Branch interest in the communications field.

C. The Post World War II Period Has Been Characterized by the Growth of Communications Activities and a Series of Narrowly Focused Studies and Limited Organizational Changes

These deficiencies became increasingly conspicuous with the enormous growth in the variety, complexity and use of telecommunications during and after World War II. In 1950, President Truman launched the first of a long and continuing series of internal studies of government organization in the telecommunications field. This study led in October 1951 to the creation by executive order of a Telecommunications Advisor to the President, charged with assisting the President on telecommunications policy and with assigning radio frequencies to federal agencies. IRAC, although formally relegated to an advisory role, continued to play a principal role in the assignment process.

In November 1958, the government's role in managing its own telecommunications facilities and in frequency allocation once again served as the focus of study. A special Advisory Committee on Telecommunications was convened by the Director of the Office of Civil Defense Mobilization, who then had the functions of the Office of Telecommunications Advisor by Presidential delegation. The Committee concluded that the creation of a Telecommunications Board in the Executive Office would help the President to meet these responsibilities. A proposal to set up a five-member Special Telecommunications Commission, submitted to Congress in March 1959, failed to obtain final approval.

A task force appointed by President-elect Kennedy in 1960 called attention to the absence of government capability for long-range and comprehensive policy-making in the telecommunications area, and recommended transfer of all OCDM telecommunications powers to a new Office for Coordination and Development of Communications Policy within the Executive Branch. But the only organizational change actually implemented was more limited in scope. By Executive Order 10995, President Kennedy in February 1962 established the position of Director of Telecommunications Management (DTM), to be held by an Assistant Director of the Office of Emergency Planning, successor to OCDM.

The President delegated his authority over government frequency allocations to the Director of OEP, authorizing him to re-delegate it, which he did, to the DTM. The President also delegated to the DTM certain Presidential emergency responsibilities under Section 606 of the Communications Act. In addition, the DTM was charged with coordinating government telecommunications policies and, in his further role as Special Assistant to the President for Telecommunications, with advising the President on telecommunications matters.

In connection with the Communications Satellite Act of 1962, a number of specific functions dealing with promotion and coordination were assigned to the President. Most of these functions were delegated to the DTM, except for the foreign relations aspects, which the President assigned to the Department of State. The FCC was invested with broad regulatory jurisdiction, patterned on its authority over existing communications common carriers. The Satellite Act also lodged certain functions in NASA, principally technical assistance to, and cooperation with, Comsat, and the provision of launch services. This assignment underscored the role of the Federal Government as a prominent source of communications R&D. Not only was the satellite itself a spillover from the rocket work of NASA and the Defense Department, but both agencies are also engaged in extensive research and development into specific communications applications of space technology. Defense has also supported a variety of other research and development projects in communications, and the Department of Commerce has for years maintained several laboratories in which research into radio communication is conducted.

The inadequate performance of government communications systems during the Cuban missile crisis prompted a Security Council investigation headed by the Deputy Under Secretary of State for Administration, William H. Orrick, Jr. As a result of that investigation, the President in 1963 established the National Communications System to facilitate the interconnection of the major existing government systems. The largest of these was the Defense Communications System, managed by the Defense Communications Agency. This system, a worldwide complex of DOD communications networks, had been formed in 1960. Prior to that time, military communications had been independently selected and implemented as an individual system for each service.

The mission of NCS was not to take over or displace, but to integrate and coordinate. The objectives were to improve performance in support of national command authorities under emergency conditions and, in the longer run, to eliminate unnecessary duplication of facilities. The Secretary of Defense was made Executive Agent and the Director of the Defense Communications Agency was made Manager, NCS. The Executive Agent and Manager are responsible for integrated planning and operations. The DTM was given a policy-advisory role.

III. THE PATCHWORK NATURE OF THE PRESENT STRUCTURE IS NOT CONDUCIVE TO OPTIMUM PERFORMANCE OF THE TELECOMMUNICATIONS ACTIVITIES AND REQUIREMENTS OF THE FEDERAL GOVERNMENT

A. Existing Organizational Arrangements Make Effective Spectrum Management Difficult

Radio frequencies are now assigned to federal agencies by the DTM, with IRAC playing an important role in the actual determination. Under existing arrangements, however, the DTM lacks the resources and clear authority to impose wholly effective controls on government spectrum uses to conserve government use of spectrum for the benefit of private users, and, of course, has no authority with regard to non-government uses.

The FCC is represented on only one subcommittee of IRAC and has no authority over the use of the radio spectrum by the Federal Government. Conversely, neither the President nor any executive agency has the legal right to review FCC frequency management for the non-federal sector. Thus, no agency is empowered to effect an equitable and efficient allocation of spectrum rights between the federal and non-federal sectors, nor to establish and enforce technical and operating standards equally applicable to all classes of users.

In addition, a lack of adequate technical staff and resources in the FCC has contributed to the procedure of allocating radio frequencies on a nationwide block basis, leading both to overuse and to underuse of the spectrum, depending on service and location. Although the government has considerable technical resources concerned with radio communications, they are principally to be found in Department of Commerce and DOD laboratories, rather than in the staffs of the spectrum managers, the DTM and the FCC. And the FCC, given the limited resources available to it and the demands placed upon it in licensing broadcasting and regulating the telephone and telegraph industries, has not devoted as much attention as seems necessary to the distinct role of spectrum manager.

B. The Absence of a Central Focus Possessing the Requisite Technological and Economic Skills Makes More Difficult the Development of a Sound and Forward-looking International Telecommunications Policy

Because telecommunications has international dimensions, the President's constitutional responsibilities for the conduct of foreign policy are inescapably involved in communications policy. This was recognized by Congress in the Cable Landing Act, which requires a Presidential grant of U.S. landing rights for any international cable, and in the Communications Satellite Act, whose special provisions for Presidential supervision were described earlier. Necessarily, therefore, the Department of State, through its Office of Telecommunications in the Bureau of Economic Affairs, plays a significant role in the formulation and implementation of U.S. communications policy, as it relates to foreign policy.*/ The expertise of this office, however, naturally leans more to foreign policy and international relations than to the technology and economics of telecommunications, which underscores the need for providing strong technical and economic support to the State Department from elsewhere in the government

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*/ The President has delegated his foreign policy responsibilities under both the Cable Landing Act and the Communications Satellite Act to State.

C. Government Research and Development and Procurement Efforts are not Organized to Ensure that Social Benefits Inherent in Telecommunications Technology are Promptly Realized

The communications industry looks to government as its most important customer in terms of product and system development. Decisions made with respect to the establishment and operation of government communications systems may have as great an impact on the future configuration of the commercial communications industry as all but a handful of policy or regulatory decisions. Yet it is precisely in the area of communications research and development and procurement that the potential for a coordinated government policy integrated with the regulatory and planning roles has gone unrealized. Government research and development efforts related to communications -- reflecting the variety of policy-formulation, resource-management, regulatory and mission-support tasks which they undergird -- are diverse in nature and scattered in organizational locale. Far greater research activities and technical expertise are to be found in the Departments of Defense and Commerce and in NASA than in the FCC and DTM; yet these capabilities are only rarely used in the formulation of telecommunications policy or in day-to-day operations of the FCC and the DTM. The FCC Chief Engineer's Office conducts technical studies of electromagnetic spectrum use, and the FCC's only laboratory, at Laurel, Maryland, tests new equipment for conformity to FCC standards. Studies similar to those conducted by the FCC are supported by the DTM in aid of its role as manager of government frequency assignments. DTM also sponsors studies of communications satellite technology and general telecommunications policy, usually through outside contracts. The scope and relevance of the information obtained, and the ability to implement conclusions reached, particularly with regard to spectrum, have been limited by the absence of a single central focus to plan and execute a coordinated program of research and by the multi-jurisdictional responsibilities.

Other agencies support primarily product-oriented communications research and development, in connection with the substantive missions for which they are responsible. This work, particularly that carried on in connection with the defense and space programs, has made significant contributions to the high rate of technological progress which has characterized the communications industry. But the differences in the product needs of government, industry and the general public reduce the impact of beneficial "spillover" effects.

A large and important area exists in which the Federal Government could promote */ the application of telecommunications concepts and technology to a variety of social ends. Currently, this role is highly fragmented -- to the extent that it is recognized at all. NASA has both the technical resources and mandate to explore the adaptation of communications satellite technology to the entire range of socially relevant purposes, but its interest in the communications aspect is incidental to its overriding concern with space exploration. The FCC has a general statutory responsibility to encourage the larger and more effective use of radio in the public interest, but as a regulatory agency it is limited in the degree to which it can play the role of communications promoter to executive agencies such as HEW, AID, and HUD. DTM lacks both the functional responsibilities and the in-house capability necessary to an effective promotional role.

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*/ Promotion is used here not in the sense of "pushing" telecommunications beyond the limits justified by considerations of efficient resource use, but in the sense of assuring that justifiable applications are not overlooked because of lack of familiarity with the current and potential state of the art.

A promotional policy would require a combination of two different, although closely related capabilities: a comprehensive and up-to-date knowledge of the present and potential technological state of the art, and the communications systems engineering competence to bring that knowledge to bear on the communications requirements of mission-oriented agencies. These capabilities do not exist in government today in the necessary form and quantity.

Neither FCC with its focus on regulatory matters, nor DTM with its focus on broad policy-making and spectrum allocation, nor even GSA, which is concerned with a wide variety of procurement and maintenance functions, possesses the requisite level of communications systems engineering skills.

Even DOD, by far the largest government consumer of communications products and service, has problems marshalling the skills and knowledge to enable it to evaluate a procurement proposal for a communications system, particularly in terms of the extent to which possibilities for systems engineering and technological innovation have been fully realized. This is not surprising. The justification for examining procurement proposals to determine whether possibilities for innovation have been fully realized relates less to the performance of a given mission than to the desirability of utilizing government's position as major consumer to ensure that the benefits of new technology are realized as promptly as possible. Unlike NASA in its field, DOD is not charged with the promotion of a technology. It is only to be expected that DOD would utilize its budgetary resources to develop capabilities directly related to its mission responsibilities, not to promote the general progress of communications technology.

The government's mission-related communications systems, especially those which form components of innovative social projects, offer wide opportunity for significant, innovative applications of new technological developments. HEW programs in the field of educational television, or medical telecommunications, for example, may well involve requirements for specially configured satellite ground stations; and specially tailored communications components might also be necessary to provide support for possible HUD programs seeking to define new relations among a variety of scattered urban groups. It is here -- in designing systems to meet mission-related communications needs -- that the need is greatest for a government capability which can bring to bear on systems requirements an intimate and comprehensive knowledge of the state of the art.

By incorporating a wide variety of technological innovations developed by a large number of firms in communications-related industries, the development of government systems and services could have a significant impact on developments within the industry as well. However, because responsibility for systems design and specifications is dispersed among a myriad of mission-oriented agencies, the procurement of telecommunications systems tends to be viewed as a mission-support function without relationship to overall national communications policy; because it is not integrated with other government policy, planning and regulatory goals, procurement policy tends to focus exclusively on the procuring of the system most closely tailored to the specific mission in question at the lowest possible cost. Except for limited cases among NCS agencies, opportunities for the sharing of systems, and for harnessing technological innovations to new social ends, thus tend to be ignored.

As a large user of communications services and products, moreover, the government has an obvious interest in bulk rates and in the development of products geared to the needs of large users. The granting of bulk rates, however, may in some cases result in an increase in charges to users who do not generate enough traffic to take advantage of them; and resources devoted to the development of products geared to the needs of large consumers are unavailable for the production of components specifically tailored to the requirements of other users. Yet government represents the public interest; and that public includes many small users. The need to relate government's roles as user and as representative of the public interest has not yet adequately been met.

D. The Absence of a Central Focus for Advice and Assistance to States and Localities has Resulted in Wasteful Duplication and Unmet Needs in Programs Utilizing Federal Funds

As a provider of technical assistance to, and as the funding and/or managing agent for a wide variety of non-federal projects which contain communications components (as in education and public safety), the Federal Government has a significant impact on the communications activities of state and local governmental units. The existing lack of coordination among the various federal agencies charged with responsibilities in these areas, however, together with the absence of any organization with a specific mandate to channel communications assistance and advice to state and local units, is said to have resulted in duplication of facilities, under-utilization of existing capacity, and in many instances, failure to meet the vital needs of state and local governmental organizations.

E. The Policy Coordination Necessitated by the Plethora of Government Telecommunications Roles is Inadequately Performed by a Multiplicity of Committees

Given the number of different federal roles in telecommunications, the necessity for coordination of policy is imperative. In theory, DTM is the focal point for coordination of federal telecommunications policy within the Executive Branch. In actuality, the coordinating role is diffused among a multiplicity of committees -- some permanent, and some *ad hoc* -- interwoven into a complicated web of formal and informal relationships. Many of these committees, moreover, have difficulty responding to the need for coordination of national and international policies and the requirements imposed by overall policy goals.

Much of this proliferation of coordinating mechanisms can be explained as a necessary response to the complexity of the issues presented and to the fact that there will always be a need for intra-governmental coordination prior to final decision. But it also would appear to reflect an attempt by the agencies concerned to adapt to the absence of a single focus for the coordination of national communications policy. Because that responsibility is at present fragmented among committees, neither the President nor the agencies concerned have available to them a source of coordinated and comprehensive policy advice. As a result, the Executive Branch has difficulty presenting a coherent and consistent position on policy problems.

F. Recent Events have Underscored the Lack of an Effective Government Capability for Long-range Telecommunications Policy Planning

The lack of a central coordinating focus is closely related to the absence of an effective capability for long-range policy planning -- policy formulated not as an *ad hoc* response to a present crisis, but as a creative shaping of the future, anticipation and avoidance of crises, and well-thought-through solutions to fundamental, as well as immediate, problems. The continuing absence of such a capability -- which may reflect in no small measure the persistence of a traditional view of telecommunications as exclusively a mission-support function rather than a critical area of public policy in its own right -- has been repeatedly underscored in recent years. Thus, the creation in 1964 of the Intragovernmental Committee in International Telecommunications to study the question of a merger of U.S. international carriers, and the creation in 1967 of this Task Force, charged with a broad mandate to re-examine our communications policy, both attest to the lack of a permanent focus for review and revision of major policy positions. Our own work, reflected in previous chapters, adds urgency to the need for effective policy-making machinery to cope with the problems of even the near-term future.

IV. STEPS MUST BE TAKEN TO IMPROVE GOVERNMENT PERFORMANCE IN COMMON CARRIER REGULATION AND BROADCAST LICENSING

A. Prior Chapters have Disclosed Weaknesses in Government Regulatory and Licensing Roles

As discussed at length in both our international industry and domestic carrier chapters, the FCC's regulatory performance has not always proved fully effective. Rather than taking the place of competition in markets having pronounced natural-monopoly features, regulation in the communications industry, in our opinion, has at times acted as a constraint on competition even in markets which do not have such features. In addition, because of its emphasis on limiting the overall profits of regulated firms, regulation has not focused as clearly as it might on overall performance in common carrier communications. In large part, moreover, the Commission lacks the resources to develop sufficient in-house capability for the analysis of major issues having technical, economic and regulatory dimensions, even when these issues are central to its regulatory responsibilities. Given the highly complex and rapidly changing character of the industry, this is a troublesome deficiency.

Similarly, broadcasting policy as elaborated by the Commission implies a degree of supervision over programming which is difficult to enforce effectively, given present levels of personnel -- if, indeed, it can be enforced at all. Moreover, although the Executive Branch has begun to sponsor measures (e.g., the Public Broadcasting Act) to provide federal assistance to non-commercial broadcasting, the various Executive agencies have provided insufficient assistance in the policy field to the FCC in terms of bringing their diverse concerns and insights to its attention, despite the obvious importance of television to such Executive Branch concerns as education.

B. Steps Must be Taken to Strengthen FCC Capabilities in These Areas

In both regulation and licensing, we find promising possibilities for strengthening the effectiveness of the FCC. As discussed in Chapter Six, relatively modest amendments to the Communications Act of 1934 would substantially strengthen the regulatory capability in the common carrier field.

In addition, the level of financial support for regulatory and licensing activities should be raised. In neither the broadcasting nor the common carrier area is the existing staff level sufficient to support effective regulation. The necessary beginning of any improvement in the broadcast licensing process continues to be the provision of sufficient resources to enable more than the superficial inspection and investigation efforts uncovered in the study of the FCC conducted by Booz, Allen and Hamilton in 1962. And sensitive and discriminating common carrier regulation requires more personnel trained in modern economic analysis and communications systems analysis than the FCC has today.

C. Greater Multi-disciplinary Capabilities Within the Executive Branch are Required, to Forecast Demand and Technology and to Provide a Framework for the Operation of Prototype Experiments

An Executive Branch capability could add to the efforts of the FCC in both the broadcast or common carrier fields. Thus, in broadcasting, the increasing importance of television in providing not only diversity but also support for the Federal Government's missions in a host of fields, highlights the need for an Executive Branch capability which can help to integrate and coordinate the variety of executive and legislative policies and interests involved. Similarly, in the common carrier field, even a substantially strengthened FCC could benefit from the assistance provided by an Executive Branch entity capable of taking the long view of policy and developing data and recommendations on a host of technological and economic aspects of telecommunications problems.

Furthermore, dramatic new technological developments -- the domestic satellite chapter provides an extended illustration -- may raise technical, social and economic questions requiring experimental operations. If we wish to ensure that our domestic and international telecommunications systems are characterized by the optimum realization of the benefits of new technology, the Executive Branch should make available for use in the regulatory process its resources for technical assistance and the systematic assessment -- in technical, economic and social terms -- of technological innovations, and should provide a framework within which pilot programs can be carried on and evaluated.

This is not to suggest that government can or should attempt to second-guess management decisions. Far from it. This would be a wholly unrealistic and unproductive procedure. But our aim should be to have the capability to take cognizance of those crucial decisions that determine the basic shape, costs and structure of our national and international transmission networks.

V. A NEW GOVERNMENT TELECOMMUNICATIONS CAPABILITY IS URGENTLY REQUIRED

A. To Meet the Needs Described Above Requires the Creation of a New Government Capability Embodying a Variety of Both Missions and Personnel

Fully to meet the deficiencies outlined in prior parts of this and other chapters necessitates, in our opinion, the creation and deployment of a new set of government capabilities. What is required, in brief, is an adequately funded focus for the centralized responsibility for spectrum management recommended elsewhere in the report; a center capable of coordinating government research and development in spectrum problems and for the provision of guidance and evaluative frameworks for a variety of communications-related pilot programs; a focus capable of responding to requests for technical advice and assistance on procurement matters, either from other agencies or from State and local governments; and a center for the provision of technical assistance and the development of new concepts and procedures in connection with regulatory policy. The overall need, then, is for a long-range planning, policy-formulating and coordinating, and mission-support capability which can serve to integrate the various roles in which the Executive Branch is presently engaged.

To its tasks, the proposed entity would bring the skills of engineers and scientists capable of analyzing the applicability of technological developments in terms of both component performance and systems design; and of lawyers, economists and statisticians capable of engaging in industry studies and, in cooperation with technical personnel, long-range technological, cost and demand forecasting. As these programs began to be implemented, one could expect a constant flow of such personnel to other communications-related Government activities, including the FCC.

B. The Executive Branch Would be Able to Make Valuable Contributions to Regulatory Decisions

The proposed entity, designed to serve Executive needs, could provide valuable assistance to the FCC. Engaged in a variety of advisory roles and in the gathering of continuously up-dated operational knowledge, the new entity would have strengthened resources for communications systems analysis, and for long-range economic and technological forecasting. Accordingly, the new entity could be a valuable source of advice and inputs in regulatory proceedings, in much the same way that the Department of Transportation is beginning to participate in proceedings before a variety of regulatory bodies. In this role, moreover, the new entity might contribute substantially to resolving conflicts within the Executive Branch cited earlier between Government as user and Government as representative of the public interest.

C. A Framework Would be Provided for More Effective Spectrum Management

As more fully developed in the chapter on the use of the radio spectrum, we believe it essential to end the divided management of the spectrum, under which DTM manages spectrum use by Federal Government users and FCC manages all other uses, with no agency empowered to coordinate spectrum use between government and non-government interests. We are particularly concerned that many new and expanded uses of the spectrum which technology may make possible and the national interest demand, might be denied in the absence of more flexible management procedures rooted in a greater degree of localism and detailed planning than is possible with divided authority and responsibility.

In the award of licenses to individual broadcasting stations, many considerations come into play besides efficient use of the spectrum, having to do with broadcasting policy and the comparative qualifications of competing applicants. The licensing of individual broadcasting stations should therefore remain the responsibility of the FCC. Specific frequency channels would be allotted to specific areas for radio and television broadcasting, on the basis of mutual agreement as to the number and location of broadcast outlets required, with the FCC assigning these channels to particular applicants. Similarly, no displacement is proposed of the Commission's responsibility for determining whether the entry of a new common or private carrier or the construction of a new line or extension (wire or radio) should be permitted as a matter of sound regulatory policy. Thus, the Commission would either issue such licenses itself or, in any event, retain power on regulatory grounds both to veto and to urge acceptance of, applications for licenses involving use of the spectrum to provide private or common carrier services.

The use of radio communications as an adjunct to an unrelated function, like taxi service, public safety, electric utility operations or air transportation, by amateur radio operators or by Federal agencies in support of their missions, does not raise the same difficult regulatory issues as in the case of broadcasting or in providing communications common carrier service. The licensing or assigning process in the case of these services is largely limited to ascertaining whether spectrum is available; coordinating and engineering assignment of frequencies;

and enforcing established technical and operating standards. Consequently, depending on the administrative framework chosen, such licensing could be done by the FCC or by the Executive agency that has general responsibility for spectrum management, provided that the spectrum manager retains the overall authority for achieving efficient and effective spectrum use.

Finally, the new entity should also be responsible for the establishment and enforcement of such technical standards and licensing requirements as may be necessary to prevent spectrum waste and "pollution" -- harmful interference with radio communications caused by users of radio frequencies for purposes other than communication; the conduct of the long-range studies in spectrum management outlined in our spectrum chapter; and the coordination of the Government radio laboratories and R&D centers conducting the technical research described in our spectrum chapter as essential to intelligent exploitation of the spectrum resource.

This complex of functions will form the core of the missions undertaken by the proposed entity. Following the pattern of the Communications Act of 1934, its central activity will be oversight and allocation of the public resource represented by the spectrum. The diverse array of disciplines involved in this task, however, can also beneficially be brought to bear on a variety of related Government telecommunications functions. Their uses in connection with regulation have already been discussed.

We turn now to a description of the benefits to be obtained from assigning to the proposed entity further supplementary functions in other areas.

D. Telecommunications Research and Development, Especially that Associated with Prototype Experiments, Would be Significantly Strengthened

Defense, Commerce, and NASA each have scientific and technical information programs through which the results of unclassified R&D sponsored by these organizations are made available to the scientific community. The R&D involved is, of course, responsive to the mission needs of the sponsoring agency. Except for the NCS, nowhere within Government, however, is this information continuously studied for potential application to the mission needs of other Government agencies, and for the accomplishment of broader national goals. The transfer of technological advances made by one agency to another is currently accomplished on an ad hoc basis as problems arise. It therefore appears desirable to establish a focal point within Government for the continuous collecting and monitoring of communications related R&D results and to search for broader applications of such R&D.

Further, communications forms a vital component of a wide range of socially innovative programs potentially involving the efforts of a broad cross-section of Government agencies. If the opportunities promised by prototype experiments are to be realized, the proposed entity will be required to play a significant role in both their initiation and organization. Thus, where the programs involved are multi-purpose or where the initiating agency lacks the requisite technical capability, the new entity would function as agent for such projects, except where they are of a type more properly sponsored by NASA. Even where the proposed entity did not itself identify the need for or initiate the project, moreover, it would provide both technical and organizational assistance and the evaluative capability that is required if such programs are to produce meaningful results.

E. Significant Opportunities Would be Presented, Especially in Connection with Procurement, for the Realization of the Benefits of New Technology

An important role of the proposed entity will be in areas where existing Government activity is rudimentary and where in some cases even the existence of a federal role is not clearly perceived. The new entity would embody both the resources and the specific mandate to help HEW, HUD, or other agencies search out new applications of communications technology which hold promise of social payoff in such areas as adult education and job training, medicine, alleviation of racial tensions, and public enlightenment and entertainment. In connection with procurement, the skills and resources associated with the proposed entity would be devoted to providing, upon request from the federal agency, State or municipality concerned, advice and assistance in technical design analysis of communications systems required to meet a given agency's needs. The systems engineering skills which the proposed entity would bring to bear on this task would make it possible for the first time, for such agencies rigorously to evaluate proposals for communications systems made by the private sectors, not only in terms of comparative costs, but also in terms of the extent to which the potential benefits of technological innovations have been realized.

In addition, where the user lacks the requisite in-house staff, the proposed entity might undertake procurement advisory responsibilities. Assume, for example, that a variety of agencies each developed program requirements which could most easily be satisfied by joint use of a single system. In such a situation, the new entity, assuming it did not itself operate the system, would function as the interface between the mission-oriented agencies involved -- HEW, HUD, and Labor, for example, none of whom possesses the requisite technical knowledge and skills -- and the operator of the system.

The changes proposed in connection with spectrum management ought to produce substantial benefits. The benefits in other areas, however -- in particular, the substantial improvement in terms of effective policy formulation and implementation and promotion of significant technological possibilities which would be realized through the proposed entity's integration of the various government roles -- ultimately depend upon the assumption by the proposed entity of a critical mass of functions. Thus, it is precisely the personnel and skills required to service a significant volume of requests for procurement and planning assistance which would be capable of bringing to bear on the investment decisions of common carriers the type of analysis previously outlined, and of providing to the State Department -- in connection with its policy role in international telecommunications matters -- the type of technological capability deemed in our view necessary. Similarly, an entity which was in continuous contact both with agency procurement officers and -- as a result of maintaining continuously up-dated knowledge concerning the entire range of communications-related R&D -- with interested manufacturers and common carriers, could ensure to private industry more effective participation on a variety of matters in the Government procurement decision-making process. As indicated above, however, the realization of that critical mass of functions will ultimately depend upon the proposed entity's ability to prove its usefulness to other governmental organizations.

F. On-going Mission-Support Telecommunications Activities Would Not be Supplanted

This proposal for a new entity does not mean centralized control over all Government communications. Indeed, such a result would be difficult to reconcile with the fact that many Government communication systems are necessarily supportive of a specific mission for which a particular agency bears ultimate responsibility. In many cases -- certain DOD systems and the FAA's Civil Aviation Communications Network, for example -- Government communications systems embody high-priority requirements for such factors as security or rapidity of response which cannot safely be subordinated to other goals. Where the mission-supporting role of communications is predominant because of the existence of an overriding need for a system geared to a mission-related set of priorities, the case is clear for leaving ultimate responsibility in the hands of the agency responsible for the mission involved. What is required, therefore, is the creation of an entity with sufficient operational responsibility to enable it effectively to integrate the various Executive roles, while avoiding that degree of preoccupation with operational responsibilities which would threaten performance of the dominant function of long-range planning and policy formulation.

Nor do we think that licensing of broadcasting and regulation of communications common carriers should be transferred from the FCC. The political sensitivity of broadcasting control, and the tradition of quasi-judicial rate regulations, counsel for the retention of these functions by an independent regulatory commission. Therefore, the suggestions that we have made for increasing the FCC's effectiveness remain important and should be adopted, and, even more important, its staff should be augmented to enable it to function more effectively than it can today.

G. Required New Programs to Meet the Pressing Need for Policy-Trained Personnel in the Telecommunications Field Would be Enhanced

One of the underlying deficiencies of the policy framework in telecommunications is the absence of programs to develop the unusual interdisciplinary skills required for the formulation and implementation of sound public policy in a field as technologically, economically and institutionally complex as modern telecommunications.

Formulation and implementation of effective telecommunications policy, moreover, is at present seriously handicapped by a shortage of qualified personnel. Our universities have not trained engineers, systems analysts, economists or lawyers equipped to grasp the interrelationships among technological developments, systems engineering requirements, the regulatory framework and economic and social policy goals; nor are opportunities afforded for officials in policy positions to obtain such skills at mid-career levels.

One answer to this need would be for government to sponsor graduate fellowships on the model of the National

Science Foundation grants. The difficulty at present, however, is not the students' need for support but the absence of settings in which the necessarily multidisciplinary programs are being offered. Nor is the problem entirely one of individuals' training. We have been struck in our studies by the lack of interdisciplinary research into questions of communications policy. Yet, this is a field in which the benefits to be gained from cooperation among lawyers, engineers, and economists are clearly substantial.

Both needs -- for broad-gauged policy training and for interdisciplinary policy research -- could be met by the establishment of one or more federally funded Communications Policy Training Programs or Institutes, perhaps located in university settings, which would have as their objective the provision of advanced training at the graduate and mid-career levels in the interdisciplinary skills required to produce capable and qualified communications systems analysts and policy makers. The funding levels required for such a program would be relatively modest, since a prerequisite for such a funding ought to be the existence of an on-going program of empirical and theoretical research on telecommunications problems within the university itself. Given the existence of such a program, moreover, the costs of many of the teaching personnel required could be shared by government and the university.

H. The Proposed Capability and the Communications Policy Training Programs Would Provide the Prerequisites for the Formulation and Implementation of Coherent and Comprehensive Telecommunications Policy

Given the critical mass referred to above, another function of the new entity would be to provide a focal point for coordination of the views of the many federal agencies concerned with communications problems, to lead in developing a more responsive and closely coordinated network of committees. Thus, by virtue of its varied roles, functions and resources, the new entity would provide an apt perspective for the fashioning of long-range communications policy positions to meet the challenges that the years ahead undoubtedly hold in this dynamic field.

All of these roles should be mutually supporting, and the synergism of the new entity would bode well for its success in its various missions.

APPENDIX

TAB A	PRESIDENT'S MESSAGE ON COMMUNICATIONS POLICY
TAB B	STATEMENT OF PARTIAL DISSENT BY GENERAL J. D. O'CONNELL
TAB C	STATEMENT OF PARTIAL DISSENT BY JOSEPH BARTLETT

90th Congress
1st Session
HOUSE OF REPRESENTATIVES
Document
No. 157

GLOBAL COMMUNICATIONS SYSTEM

MESSAGE

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

RECOMMENDATIONS RELATIVE TO WORLD COMMUNICATIONS

August 14, 1967.—Referred to the Committee on Interstate and Foreign Commerce and ordered to be printed

To the Congress of the United States:

Man's greatest hope for world peace lies in understanding his fellow man. Nations, like individuals, fear that which is strange and unfamiliar. The more we see and hear of those things which are common to all people, the less likely we are to fight over those issues which set us apart.

So the challenge is to communicate.

No technological advance offers a greater opportunity for meeting this challenge than the alliance of space exploration and communications. Since the advent of the communications satellite, the linking of one nation to another is no longer dependent on telephone lines, microwaves or cables under the sea. Just as man has orbited the earth to explore the universe beyond, we can orbit satellites to send our voices or televise our activities to all peoples of this globe.

Satellite communications has already meant much in terms of human understanding.

—When President Lincoln was assassinated, it took twelve days for the news to reach London. Britons watched and grieved with us at the funeral of John F. Kennedy.

—Europeans watched Pope Paul speak to the United Nations in New York—and Americans saw his pilgrimage to Fatima.

—The peoples of three continents witnessed the meeting of an American President and a Soviet Premier in Glassboro.

The future of this new technology stirs our imagination.

85-011

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In business and commerce—

- —Commercial telephone calls will be carried routinely by satellite to every part of the globe.
- —Rapid and universal exchange of data through satellite-linked computers will encourage international commerce.
- —Productive machinery can be operated at great distances and business records can be transmitted instantaneously.

In education and health—

- —Schools in all lands can be connected by television—so that the children of each nation can see and hear their contemporaries throughout the world.
- —The world community of scholars can be brought together across great distances for face-to-face discussions via satellite.
- —Global consultations, with voice and pictures, can bring great specialists to the bedsides of patients in every continent.
- —The art, culture, history, literature and medical science of all nations can be transmitted by satellite to every nation.

Who can measure the impact of this live, direct contact between nations and their people? Who can assess the value of our new-found ability to witness the history-making events of this age? This much we know: because communication satellites exist, we are already much closer to each other than we have ever been before.

But this new technology—exciting as it is—does not mean that all our surface communications facilities have become obsolete. Indeed, one of the challenges before us is to integrate satellites into a balanced communications system which will meet the needs of a dynamic and expanding world society. *The United States must review its past activities in this field and formulate a national communications policy.*

U.S. ACTIVITIES TO DATE

The Communications Act of 1934 has provided the blueprint for federal involvement in the communications field. That Act, and the Federal Communications Commission it created, have served our national interest well during one-third of a century of rapid communications progress.

The Communications Satellite Act of 1962 established a framework for our nation's participation in satellite communications systems. Congress weighed with care the relative merits of public and private ownership of commercial satellite facilities. The Act authorized creation of the Communications Satellite Corporation (ComSat)—a private corporation with public responsibilities—to establish a commercial satellite system.

In 1964 we joined with 10 other countries in the formation of the International Telecommunications Satellite Consortium (INTELSAT). 58 nations are now members. Each member contributes investment capital and shares in the use of the system. ComSat, the U.S. representative, is the consortium manager and now contributes 54% of the total investment. All satellites managed by ComSat are owned by INTELSAT—so that commercial satellite communications has from its beginning been a product of international cooperation.

Progress has been rapid. Early Bird was launched in 1965. Now the INTELSAT II series serves both the Atlantic and the Pacific. Twelve ground stations—the vital links for sending and receiving messages—have been constructed over the world. 46 are anticipated by the end of 1969.

Today, just five years after the passage of the Communications Satellite Act and three years after the INTELSAT agreement, developments have exceeded our expectations:

—The synchronous satellite, which rotates with our globe and thus maintains a stationary position in orbit, has been developed well ahead of schedule.

—Those responsible for U.S. international communications—with ownership divided among a number of surface carriers and ComSat—now look forward to an integrated system which will utilize satellite technology.

—Proposals are being discussed for the establishment of a domestic communications satellite—either limited to TV transmission or servicing a variety of domestic communications uses.

Because we have been the leaders in the development and use of satellite communications, other countries are deeply interested in our country's position on the continuation of INTELSAT, and in the importance we assign to international cooperation in the field of satellite communications.

On February 28, 1967, I declared in a message to Congress:

> Formulation of long range policies concerning the future of satellite communications requires the most detailed and comprehensive study by the executive branch and the Congress. I anticipate that the appropriate committees of Congress will hold hearings to consider these complex issues of public policy. The executive branch will carefully study these hearings as we shape our recommendations.

A number of important communications issues are presently before the Federal Communications Commission for consideration. Some of them have been discussed in the Senate and House Commerce Committee hearings on the Public Television Act of 1967. ComSat and the State Department have opened discussion of the international questions with our foreign partners and their governments.

In order to place this important policy area in perspective, I want the views of the President to be clear. This message includes a report of the past, a recommendation for the present, and a challenge for the future.

Global Communications System

Our country is firmly committed to the concept of a global system for commercial communications. The Declaration of Policy and Purpose of the Communications Satellite Act of 1962 set forth Congressional intent:

> The Congress hereby declares that it is the policy of the United States to establish, in conjunction and in cooperation with other countries, as expeditiously as practicable a commercial communications satellite system, as part of an improved global communications network, which will be responsive to public needs and national objectives, which will serve the communications needs of the United States and other countries, and which will contribute to world peace and understanding.

The INTELSAT Agreement of 1964—to which 58 nations have now adhered—left no doubt as to its purpose. Its preamble expressed the desire:

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> *** * * to establish a single global commercial communications satellite system as part of an improved global communications network which will provide expanded telecommunications services to all areas of the world and which will contribute to world peace and understanding.**

Of course, these agreements do not preclude the development and operation of satellite systems to meet unique national needs. The United States is developing a defense system—as will others. But INTELSAT members did pledge that commercial communications between nations would be a product of international cooperation.

Today I reaffirm the commitments made in 1962 and 1964. We support the development of a global system of communications satellites to make modern communications available to all nations. A global system eliminates the need for duplication in the space segment of communications facilities, reduces the cost to individual nations, and provides the most efficient use of the electro-magnetic frequency spectrum through which these communications must travel.

A global system is particularly important for less developed nations which do not receive the benefits of speedy, direct international communications. Instead, the present system of communications—

—encourages indirect routing through major nations to the developing countries,

—forces the developing nations to remain dependent on larger countries for their links with the rest of the world, and

—makes international communications service to these developing nations more expensive and of lower quality.

A telephone call from Rangoon to Djakarta must still go through Tokyo. A call from Dakar, Senegal, to Lagos, Nigeria, is routed through Paris and London. A call from American Samoa to Tahiti goes by way of Oakland, California. During the recent Punta del Este conference, I discovered that it usually cost Latin American journalists more than their American colleagues to phone in their stories because most of the calls had to be routed through New York.

Such an archaic system of international communications is no longer necessary. The communications satellite knows no geographic boundary, is dependent on no cable, owes allegiance to no single language or political philosophy. Man now has it within his power to speak directly to his fellow man in all nations.

We support a global system of commercial satellite communications which is available to all nations—large and small, developed and developing—on a non-discriminatory basis.

To have access to a satellite in the sky, a nation must have access to a ground station to transmit and receive its messages. There is a danger that smaller nations, unable to finance or utilize expensive ground stations, may become orphans of this technological advance.

We believe that satellite ground stations should be an essential part of the infrastructure of developing nations. Smaller nations may consider joint planning for a ground station to serve the communications needs of more than one nation in the same geographic area. *We will consider technical assistance that will assist their planning effort.*

Developing nations should be encouraged to commence construction of an efficient system of ground stations as soon as possible. When other financing is not available, *we will consider financial assistance to emerging nations to build the facilities that will permit them to share in the benefits of a global communications satellite system.*

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CONTINUATION OF INTELSAT

The 1964 INTELSAT agreement provides only interim arrangements—subject to renegotiation in 1969. Our representatives to the consortium will soon begin discussions for a permanent arrangement.

We support the continuation of INTELSAT. Each nation or its representative contributes to its expenses and benefits from its revenues in accordance with its anticipated use of the system. The 58 members include representatives from the major nations who traditionally have been most active in international communications. It has been a successful vehicle for international cooperation in the ownership and operation of a complex communications system.

We will urge the continuation of the consortium in 1969. The present arrangements offer a firm foundation on which a permanent structure can be built.

Some nations may feel that the United States has too large a voice in the consortium. As heavy users of international communications, our investment in such an international undertaking is exceptionally large. The early development of satellite technology in the United States and the size of our investment has made it logical that ComSat serve as consortium manager.

We seek no domination of satellite communications to the exclusion of any other nation—or any group of nations. Rather, we welcome increased participation in international communications by all INTELSAT members. We shall approach the 1969 negotiations determined to seek the best possible permanent organizational framework.

- —We will consider ceilings on the voting power of any single nation—including the United States—so that the organization will maintain its international character.
- —We will support the creation of a formal assembly of all INTELSAT members—so that all may share in the consideration of policy.
- —We favor efforts to make the services of personnel of other nations available to ComSat as it carries out its management responsibilities.
- —We will continue the exchange of technical information, share technological advances, and promote a wider distribution of procurement contracts among members of the consortium.

It is our earnest hope that every member nation will join with us in finding an equitable formula for a permanent INTELSAT organization.

DOMESTIC COMMUNICATIONS SATELLITE SYSTEMS

Communications satellites have domestic as well as international applications. Satellites that can beam telephone calls or television programs between New York and Paris can do the same between New York and Los Angeles. Daring proposals have already been made to tap the vast U.S. domestic market.

Our awareness of the social and economic potential of this new technology is met by similar excitement around the globe. Each nation will be making decisions about how domestic communications needs can best be met. The position taken by the United States is particularly important because our domestic market is so large and our role in international communications is so extensive.

There are important unanswered questions concerning the operation of a domestic system. Assuming these questions are answered favorably, we still must make the decision to move forward with such a system consistent with our international obligations.

The space segment of a communications satellite system is international by its very nature.

—A synchronous satellite occupies a permanent orbital position in the international domain of outer space.

—All satellites radiate electro-magnetic energy potentially capable of interference with other communications systems.

—All satellites use the internationally regulated frequency spectrum.

In view of the international nature of satellite communications and our commitments under the INTELSAT agreement of 1964, we should take no action in the establishment of a domestic system which is incompatible with our support for a global system.

This does not mean that the United States—or any other nation—will give up vital sovereignty over domestic communications. The flow of satellite communications—both domestic and international—is to and from ground stations owned by the individual nation or its representatives. Each country will have to determine for itself whether it wants to use communications satellites for domestic purposes. It must be prepared to bear the expense of such satellite use, just as it will derive any revenues.

It is the space segment—not the ground station—that is of legitimate international concern. How should a nation utilize satellites for domestic communications purposes?

There are several possible choices:

—A nation can lease circuits from an international INTELSAT satellite.

—It could elect to operate a separate satellite for its own domestic use.

—It could join with neighboring countries to operate a separate satellite.

Logically, this decision should be based on economic grounds—whether domestic requirements can be met most efficiently and economically by a satellite owned by INTELSAT, or by a separate satellite. Present studies indicate that a high volume of domestic traffic is necessary for a separate satellite to offset the cost advantage of sharing the use of an international satellite. The same considerations apply if domestic needs are to be met by a satellite shared by several nations.

If the regional satellite is to carry international traffic as well, INTELSAT—the international communications consortium—has an important stake in the result. Adequate provisions must be made so that any international traffic which is diverted will not jeopardize the economic efficiency of the INTELSAT system or limit its extension to developing countries.

INTELSAT members should adhere to INTELSAT supervision in any use of domestic or regional satellites.

Such supervision should include coördination of design so that all communication by commercial satellite is compatible with the global system. We must not sacrifice our goal of direct communications links among all nations. Domestic and international traffic should be able to flow freely through the entire global system, limited only by the technology itself.

Technical regulation is also necessary so that positions in orbit can be assigned, frequencies can be allocated, and energy from satellites does not interfere with other communications systems.

The alternative to this type of coordination is international communications anarchy—lack of inter-connections, needless expense, pollution of frequencies, radio interference, and usurpation of orbital spaces. Nations should have no hesitation in choosing the route of international cooperation.

Participation by Other Nations in INTELSAT

I urge the Soviet Union and the nations of Eastern Europe to join with the United States and our 57 partners as members of INTELSAT. INTELSAT is not a political organization. It holds no ideological goal except that it is good for nations to communicate efficiently with one another. It seeks no diplomatic advantage. It is quite simply a cooperative undertaking of many nations to finance an international communications system which is of advantage to all.

In 1963, this invitation was extended by the governments of those nations which joined in the creation of INTELSAT. Today, I renew that invitation on behalf of our government.

I have stated many times my hope that our commercial activities with the Soviet Union and Eastern Europe will grow, that our contacts will increase, and that we will emphasize those matters in which our interests are common rather than dwelling on those issues which divide us.

Here is a rare opportunity to join in an activity to bring benefits to all nations and loss to none. Recently the Soviet Union ratified the treaty for the peaceful uses of outer space. Nothing could better symbolize the truth that space belongs to all men, than an international undertaking that permits the free flow of communications. I earnestly hope that the Soviet Union and the nations of Eastern Europe will join in this historic action.

The Soviet Union is a leader in satellite technology. I am advised that there is no insurmountable technical obstacle to an eventual linking of the Soviet MOLNIYA system with the INTELSAT system. The peoples of the world could rightfully rejoice if our advances in satellite technology were accompanied by this act of global cooperation.

Of course, this participation would require a revision of investment and voting ratios based on Soviet anticipated use of the system. Our representatives in INTELSAT are ready to participate in immediate discussions to make that membership possible.

International Communications Ownership

Most nations handle their international communications through a "chosen instrument"—generally, a government owned entity. The United States has no chosen instrument. Several record carriers and one voice carrier handle international traffic. In addition, ComSat provides satellite circuits to these carriers.

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Our normal instinct is to favor the existence of multiple companies in each commercial field. We believe that competitive pressures—among technologies as well as companies—will usually generate lower prices for the user. Congress recognized in the 1962 Act that ComSat would be required to deal with several international carriers.

Yet, there is a legitimate question as to whether the present division of ownership continues to be in the public interest. Critics argue that:

—International communications are provided by an industry which is regulated in its rates and practices. Price competition, as we usually use that term, does not exist.

—Divided ownership has resulted in the construction and maintenance of expensive, duplicating communications facilities which increase operating costs and result in higher rates for the user.

—Our nation is in a relatively poor bargaining position on communications matters with foreign counterparts since we do not speak with a single voice.

—Disputes have existed between ComSat and the surface carriers over who should own the ground stations in the international system.

—Defense communications in the future could be subjected to delay.

Several proposals have been advanced which would affect our international communications posture. Legislation has been proposed to permit a merger of one or more of the international carriers. It has been suggested that ComSat should be permitted—in certain circumstances—to contract directly with users other than the international common carriers.

Questions have been raised whether additional communications capacity should be developed through surface cables, utilization of satellites, or other technologies.

A continuation of the review of these issues is desirable.

TASK FORCE ON COMMUNICATION POLICY

I am appointing a Task Force of distinguished government officials to make a comprehensive study of communications policy.

It will examine a number of major questions:

—Are we making the best use of the electro-magnetic frequency spectrum?

—How soon will a domestic satellite system be economically feasible?

—Should a domestic satellite system be general purpose or specialized, and should there be more than one system?

—How will these and other developments affect COMSAT and the international communication carriers?

These are complex questions. Many of them are being presently weighed by the Federal Communications Commission. But a long, hard look must also be taken by all parties with responsibility in this area—for the ultimate decisions will work a revolution in the communications system of our nation.

This Task Force will examine our entire international communications posture. It should investigate whether the present division of ownership in our international communications facilities best serves our needs, as well as which technology can meet new communication requirements in the most effective and efficient manner.

The task force may establish working groups of government and non-government experts to study various technical, economic and social questions.

The task force should also determine if the Communications Act of 1934 and the Communications Satellite Act of 1962 require revision. I am asking the task force to report to me from time to time and to make its final report within one year.

Government Organization

Our government must be organized to carry out its responsibilities in the communications field. Present authority is widely dispersed. The Federal Communications Commission has heavy responsibilities under the 1934 and 1962 Acts. The President and many agencies have responsibilities under these Acts, various Executive Orders, and as part of their general duties.

Communications is a vital public policy area—and government organization must reflect that challenge.

I have asked the Bureau of the Budget to make a thorough study of existing governmental organization in the field of communications and to propose needed modifications.

Conclusions

This message does not create a new communications policy for our nation. Rather it proposes the foundation for that policy.

--It reaffirms our intentions as a partner in INTELSAT.

--It considers the need for modifications in our international communications posture.

--It sets in motion the necessary studies for a better understanding of policy needs in domestic and international communications.

The challenge of this new technology is simple—it is to encourage men to talk to each other rather than fight one another.

Historians may write that the human race survived or faltered because of how well it mastered the technology of this age.

Communications satellites now permit man's greatest gifts—sight, expression, human thoughts and ideas—to travel unfettered to any portion of our globe. The opportunity is within our grasp. We must be prepared to act.

LYNDON B. JOHNSON.

THE WHITE HOUSE, *August 14, 1967.*

DISSENTING STATEMENT TO THE REPORT

of the

PRESIDENT'S TASK FORCE ON COMMUNICATIONS POLICY

by

James D. O'Connell, Vice Chairman

December 10, 1968

This document is necessary because of the basic differences we have with the Task Force Report, particularly with certain specific conclusions of the chapters dealing with the United States International Communications Industry, the Domestic Applications of Communication Satellite Technology and the Domestic Telecommunications Carrier Industry. We are also concerned with the relative roles envisioned by the Task Force Report for competition, innovation and regulation as factors in the development of better telecommunications service at lower cost.

This dissenting statement should not be taken as an indication of total disagreement with all conclusions and recommendations of the Report; nor should it be construed as indicating that our disagreement is limited to matters explicitly identified herein.

This summary statement endeavors to present those points which appear to have the greatest potential for impact on the future development of telecommunications. We have expanded discussion of the points which we considered to be most fundamental in a series of appendices attached hereto.

It is my opinion that full recognition should be given to the complexity of the task; to the great difficulty of analyzing, researching and reaching conclusions and recommendations within an effective period of one year concerning issues of such great importance to the economic and social progress of the Nation. It is noteworthy that this Report represents an attempt at the broadest review of our national telecommunications that has ever been undertaken.

Studies made, both before the Task Force was created as well as in support of the activities of the Task Force, have left no doubt as to the growing importance of telecommunications in the economic, cultural and political affairs of both the United States and the world community. Our national telecommunications complex is the largest and is recognized as the most efficient, economical, and reliable network in the world and one which is innovating its technology and services at an ever increasing rate. This has been clearly stated in the Task Force Report. The most significant problems in the domestic services involve the future of the public message telegraph service and the orderly, efficient introduction of communications satellites into domestic services.

In the field of international telecommunications there have been recurring recommendations at frequent intervals over the past 25 years from industry and Government that a merger of U.S. international carriers would be in the national interest. The advent of satellite communications and the problems arising from the Communications Satellite Act of 1962 have reinforced the case for a merger.

While concurring with the finding that a merger of international carrier operations is necessary, I conclude that the conditions which are to be imposed on the merged entity, as recommended in the Task Force Report, are so restrictive as to make the objectives to be achieved by the merged entity impracticable of attainment.*

This dissent concludes further that the formation of a single international entity which includes Comsat should not debar Comsat and INTELSAT from participation in domestic satellite service. Such participation may in the future prove most efficient and economical in satisfying domestic needs. It is concluded further that this prohibition can seriously restrict the development of the full potential inherent in communications satellite technology. These conclusions will be discussed in greater detail further on.

There is dissent also with most of the conclusions and recommendations contained in Chapter Six "Domestic Telecommunications Carrier Industry." The proposal to break the integrated national system into two separate parts (private line and switched public message network) for tariff, operational and management purposes is unrealistic because it does not recognize the highly integrated nature of the private line and public message services, and the interactions between the two, both economically and technically.** It is submitted that this recommendation, if put into effect, would be counterproductive to one of the basic general objectives identified in the Task Force Report -- more rapid innovation. This proposal will be particularly harmful to Western Union and to the approximately 2,000 independent telephone companies. Furthermore, one of the results would be to lower rates for large private line users in the areas of heavy long haul traffic with the adverse result of raising rates to all other users if the overall current rate of return is maintained.***

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* See Appendix C, for more concerning these conditions.

** See Appendix D, for further treatment of this subject.

*** This would tend to be especially harmful to users in small communities and rural areas.

The recommendation has previously been made that this chapter be omitted from the Task Force Report, first, because it is not, in our opinion, responsive to the President's Message and, second, because there has not been sufficient time to give this complex subject the comprehensive research and analysis that it requires.

Our basic dissent with respect to Chapter Seven (Future Opportunities for Television) is that it is not relevant to the President's Message and we can establish no satisfactory case for its inclusion. Its predominant preoccupation with the objective of promoting greater diversity of programming is one which has been discussed for a long period of time by many authorities, and the material in this chapter does not appear to make unique contributions to these discussions. The relative merits and the roles of over-the-air TV, CATV, and pay-TV are all matters now before the FCC, and it would appear that the conclusions and recommendations reached by the Task Force in regard to such matters as the concentration of the ownership of the cable television industry (Chapter Seven, pages 49 and 50) should have been left to the regulatory agencies which have statutory responsibility over these matters.

With respect to Chapter Five "Domestic Applications of Communications Satellite Technology," we are in agreement with the need for a pilot domestic satellite program to develop and prove the technical, operational and economic aspects of the domestic use of satellite communications. In our judgment, the system should be given every reasonable opportunity to prove its capabilities at the earliest possible time. Thus, it seems important to minimize delay by limiting the number of trustees who would own the pilot system. Such action would create a more efficient management structure which would tend to lower the costs of the program. Termination of the trusteeship would then be more readily and simply achievable. The Report does not fully consider the many advantages in negotiating with INTELSAT for utilization of an INTELSAT satellite for the pilot program. A suitable arrangement with INTELSAT could result in a substantially more economical utilization of space segments during the pilot experiment, without any commitment beyond the pilot phase. In that regard, the Task Force Report offers no proof to support the statement on pages 37 and 38 of Chapter Five -- that procurement of the space segment from INTELSAT would create severe economic distortions or raise substantial legal and policy problems.

There are two general themes which run through most of the Report. The first is the need for more competition; the second, the need for greater innovation. I have no disagreement whatever with these objectives, but I disagree with the philosophy that these are ends in themselves as they are applied to the telecommunications carrier service. Fundamental goals are improvement of service and reductions in cost, and these goals are being progressively achieved. There is no question that competition, properly employed in an appropriate market place, can and does produce economic benefits, stimulates innovation, and minimizesthe need for Government intervention or regulation. But the question before us in the furnishing of telecommunication services is the nature of the market place, the record of the results produced, and the promises and problems of the future. In our judgment, the unique and peculiar nature of telecommunications services makes it of paramount importance that the record, the promises, and the prospects of competitive benefits be critically examined.

It is a faulty conclusion, in our opinion, that we can automatically move more rapidly toward improved telecommunications services either through the expedient of creating more competition between communications carriers or by introducing greater innovation in communications hardware in this highly complex national telecommunications structure. It is perhaps worthy of note that while Chapter Two of the Report recommends the advantages of consolidation of competing long haul facilities to rectify numerous difficulties, Chapter Six proposes the creation of new competing long haul facilities.

There is no lack of appreciation or enthusiasm for competition when it can, and does, produce desirable results in the field of innovation, improvement of service, and cost reduction. However, there is a long history of the adverse effects upon the public interest during the years of intense competition in the telephone industry. It is important to consider the long record of judicial and administrative decisions, which suggests that our overall national philosophy of the unfailingly beneficial results of competition cannot be applied across the board to the telecommunications service sector of the national economy.* It is one conclusion of this dissent that all proposals for increasing or decreasing competition in this industry should be examined much more closely in the light of past history and in greater detail as to future implications and effects than has been possible within the time frame of the Task Force study, and that the experience and views of all elements of the industry involved should be given more consideration.

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* See Appendix A, which treats this subject in greater detail.

My further conclusion is that Government regulation should be strengthened in its areas of competence, but that no serious lack of regulatory authority exists at the present time. We would also recommend that the regulatory functions not be extended into the legitimate realm of management responsibility which the Task Force Report would impose upon the single international entity.

Further in regard to the theme of innovation, we maintain that no case for lack of innovation in telecommunications has been made in the Task Force Report.* In fact, the Report repeatedly comments on the present pace of innovation. Actually, innovation is proceeding at a faster pace than ever before in the telecommunications service industry. A strengthened Government capability to foresee legal and regulatory impediments to further improvements in service is needed and this is also a conclusion of the Task Force Report.

Another major theme which appears in the Task Force Report concerns vertical integration, i.e., the ownership or affiliation by common carriers of manufacturing facilities or affiliates. Chapter Two recommends a prohibition against the acquisition of manufacturing facilities by the merged international entity. In Chapter Six, however, after discussing the pros and cons, the conclusion is stated that in the domestic field the available evidence and time have not permitted a decision to be reached as to the desirability or undesirability of vertical integration.

It is a conclusion of this dissent that the basic issues in respect to vertical integration have not been clearly set forth in the Report. It is important to recognize that the achievement of reliable and economical service involves research, development, manufacturing, installation and maintenance. More extensive development of separate manufacturing capabilities appears justified only to the extent that it would inevitably result in significant improvements in service to all classes of users. In this context it is not justified as an end in itself, nor are we able to determine with confidence that the objective of improved service would be achieved.* It appears to us significant that those nations whose telephone structures are based wholly or in substantial measure on the concept of vertical integration have, by accepted standards of measurement, the most advanced, most efficient and lowest-cost service to their general public.

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* See Appendix C for discussion of the interaction between innovation and vertical integration.

It is recognized that the foregoing observation is general; but it is important and worthy of consideration. It is emphasized, however, that more profound examination of the practicalities of each situation is indicated.

For example, in the case of satellite communications, where a large part of the aerospace industry has been developed with major financial support by the Government, where the market predominantly consists of the Department of Defense and NASA, where the requirements for commercial communications satellites form only a small share of the total requirements, and where present aerospace industry capacity is more than amply sufficient to provide for commercial needs, the establishment of an additional manufacturing facility for space hardware by Comsat or by a new international corporation appears unjustifiable.

On the other hand, when one considers the past history of development to meet primarily the needs of the telephone industry, it is clear that a major factor in the success, rapid progress, and low cost of telephone service in this country has been due to vertical integration, and the great improvements in planning and economies of scale which this makes possible. A further conclusion of this paper is that the Task Force Report does not give sufficient importance to the economies inherent in equipment standardization. It would be illuminating, for example, to examine the experience of major Government users and procurers of telephone equipment on a competitive, low bid basis to determine the added costs and supply difficulties experienced over the years with the need for multiple stockage of replacement parts of many different types of telephone equipment. There has been no indication in the Task Force Report of consideration of such factors.

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* It is worthy of note, however, that the industries which manufacture hardware for the telephone industry are prospering and growing. Their displays and offerings at National Telephone Conventions are increasing. Their products are bought both by the independents and the Bell System to the extent they offer improved products at acceptable prices.

Unless inhibited by legal or regulatory actions the independent portion of the telephone industry should grow and prosper in the future -- there will be further development of vertical integration as the large independents become even larger and this should result in further innovation, better service and reduced percentage costs to these service companies.

Chapter Nine has explored the range of interests and the stake which the Executive Branch has in the development of national policy in telecommunications. It has indicated the importance of adequate participation in a thoroughly coordinated way in the development of national policy and the decisions which establish policy. We believe this has been a most useful contribution in an area which has not been adequately explored before. However, the recommendations of Chapter Nine give us some trouble because we believe that further experience with a modestly expanded capability is required before considering whether an Executive Branch telecommunications management activity of the size and scope envisaged by the Report is necessary.

The Report does not sufficiently emphasize that many of the present shortcomings in the telecommunications policy area are the result of failure over a long period of time to provide modest increases in resources to the Executive Branch and the FCC. The telecommunications policy problems which will confront the Government will become increasingly complex and assume greater importance during the period that the Task Force recommendations are under consideration; any legislative action is being taken; or any new organization is being established. Additional resources are needed now and will be required in the future if those problems are to be fully considered and solved. Provided with the essential resources, the Executive Branch and the FCC can initiate the necessary improvements expeditiously and at modest cost. Any expanded Government capability should not be diverted from its primary responsibility for the development of telecommunications policy to functions which would be operational in nature.

This Chapter, and to some extent other portions of the Report as a whole, appears to inject the Government into decision-making which is the proper prerogative of industry's management. Enhancement of Government capabilities to develop knowledge and analysis in telecommunications policy should be done in close cooperation with industry, but should most carefully and clearly avoid the dangers of Government infringement of the management responsibilities of the industry.

There is need for an expanded Executive Branch capability for the effective achievement of national policies in telecommunications. However, insufficient time has been available to determine the specific scope and functions which should be included within the Executive Branch. The present study being done by the Bureau of the Budget may provide a foundation for specific recommendations.

This paper expresses disagreement with certain concepts, conclusions, and recommendations of the Task Force Report. We wish to make it clear, however, that our primary objective is constructive action in those essential areas where progress seems most needed.

We are in agreement with the Task Force Report that the national interests would be best served by a consolidation of the present United States international carriers and their facilities. We propose that the resulting structure be a privately owned commercial enterprise organized to achieve high efficiency, economies of scale, progressive improvements of service, innovation, and minimum rates to its customers. It should offer to present and future management, to its shareholders, and to its foreign correspondents a structure which is logical in a business sense and which can operate with optimum simplicity and economy. It should receive from the Executive Branch of Government an adequate flow of information and guidance as to national policy. There should be no Government invasion, apparent or real, of the responsibilities of management. The organization should be carefully and adequately regulated (but not managed) by the Government and adequate resources should be made available so that the regulation is thoroughly effective. Periodic audits of this effectiveness are possible and should be conducted by competent Government personnel. It is concluded that primary concern should be the creation of an organization which has all the elements necessary for its successful operation in the national interest and constraints, restrictions and inhibiting factors should be reduced to the minimum.

Due to the need for a tight integration and management of the research, manufacturing, and operational elements of a truly efficient telecommunications system, reliance must primarily be placed upon effective Government regulation, rather than on the forces of competition, if good service at reasonable cost is to be maintained and improved. If

Government regulation is to be truly effective, it must be efficient. It is central to the public and national interest that there be respect and confidence on the part of the Congress, the Executive Branch, industry and the general public in the capabilities, objectivity and effectiveness of the regulatory process.

If this confidence is not maintained it is inevitable that there will be recurrent efforts, both within Government and outside it, to contrive means to constrain or modify the regulatory process. In the past, some of the decisions which have hybridized regulation with competition have had the effect of reducing elements of competition which were already at work.

In our judgment the FCC performance in the regulation of common carriers has not received the respect it deserves. Its resources have been small, and its problems many and complex. Despite this, however, a broad overview of the international and domestic industry clearly shows general progress and rapid growth. Although there has not been agreement within Government with some FCC decisions in the international area, the more study we devote to its problems, the more we tend to recognize that it is the inordinate complexity of the U.S. international structure and its legal environment which are at the heart of the problem.

We would like to express confidence in the regulatory process. However, it simply must have a substantial augmentation of resources. Given the resources, we are confident that the regulatory process can be improved and progressively modernized to meet the needs of the future, and that intelligent evolution rather than revolution will best serve our needs. In our judgment the results to be obtained by a well reasoned and informed regulatory process are much more likely to achieve innovation and progress than ad hoc experiments with contrived competition.

Unquestionably there is a need to devise policies which will permit the maximum growth and utilization of the capabilities of the new mode of satellite communications. This new mode has great potentials, but it is in a relatively early stage of its development. While many of its potentials can be visualized at this time, quantification of its economic costs and methods of systems integration with existing modes have not been accurately determined.

The Task Force has recommended an experimental system to quantify these unknowns in its proposal for a pilot domestic system for the United States. We think this experiment should be afforded the maximum opportunity to prove the capabilities of communications satellites. Thus, simplicity in structuring and an opportunity for maximum economies should be guiding principles. We conclude that the chances for success will be maximized by making it an all-purpose system, capable of handling all types of communications traffic.

In due course, specialized systems for handling exclusive services such as data may prove to be practical and economical, and should not be foreclosed. But the pilot system should have a fair chance to prove its capabilities. Furthermore, conclusions, such as the one proposed by the Task Force that there should be rigid separation between the domestic and international services, should be avoided. Rigid conclusions in this respect seem premature by the very nature of the potentials of this new technology.

As a final observation, we consider Chapter Eight "The Use and Management of the Electromagnetic Spectrum" to be a valuable contribution to the future of telecommunications in the United States. The cooperation of all interests in the development of such a presentation, in an area fraught with difficulties, is particularly noteworthy. We concur generally with this chapter, noting that the necessary courses of action for both the FCC and the Executive Branch are now well known, and that increased resources in spectrum management are more immediately important and attainable than proposed transfers of authority from the FCC to the Executive Branch. If the necessary resources cannot be attained in any other way than the transfer of authority to an enlarged entity in the Executive Branch, this course of action might then be justifiable.

J. D. O'Connell

Attachments: Appendices A through D

APPENDIX A

The Role of Competition in the Provision of Communications Service

A basic disagreement with the Task Force Report involves the undue emphasis that the Report places on competition as the optimum environment to provide the best telecommunications service to the American public at the lowest cost. The theme of the Task Force Report, as it applies to both the international carriers (Chapter II) and the domestic carrier industry (Chapter VI), is that while some services can best be provided by a single carrier -- for example, the public message telephone service -- other services such as private line and record services, can best be provided by competing carriers. The underlying philosophy is that where a "natural" monopoly must exist in order to provide good service -- for example, gas, telephone, or electric service -- the monopoly should be of a minimum size, with competition preserved unless a clear and convincing case is made that competition is not feasible. We disagree with this principle as it is applied to the telecommunications service industry.

While the Task Force Report generally acknowledges that competition between telephone carriers is neither feasible nor desirable at the local level, it is suggested that competition between carriers might have some beneficial results if it is applied to inter-city transmission; particularly in the private line service. It is argued that innovation would proceed at a faster pace and that the pressure on each carrier to lower costs and, therefore, its rates would, in turn, provide better service at lower cost to all communications customers. The Report would create a merged international carrier much too narrowly restricted and closely supervised by the Government to provide optimum service; domestically, the division of long haul traffic into message and private line categories is unrealistic, and will not lead to the reductions in costs that the Report expects.

Experience going back some seventy years has demonstrated that competition in the provision of local telephone service was inherently inefficient and led to poorer quality service at higher cost. It is submitted that the same rationale applies today in the long haul telephone and teletypewriter services, which, with direct distance dialing, automatic message accounting, and flat rate services, such as WATS, have become more and more technically like local telephone service. It seems that before a new national policy is proposed for domestic service that the development of the present domestic industry ought to be reviewed in some detail to determine the specific problems engendered by competition, with a view toward avoiding the same difficulties at the national level that were experienced, and solved, at the local level.

The initial period of development in the telephone industry took place in an extremely competitive climate until about the turn of the century when it became apparent on the local level, at least, that any benefits which might be expected in the way of lower charges and more efficient service were not being derived from free and unfettered competition. On the contrary, competition between several telephone companies serving the same area was resulting in poorer service to customers, general inconvenience to the general public, and higher charges. There was a wasteful duplication of inside and outside plant with increased cost to customers; rate wars drove companies into bankruptcy; telephone equipment was not standardized, thereby making interconnection difficult, if not impossible; streets were torn up frequently to lay duplicating conduit; and excessive number of telephone poles were erected by the competing companies creating unsightly urban areas; and frequently business and professional people were required to subscribe to the two or three services in their area (and have the same number of instruments on their desks) in order to have adequate connections available.

The obvious solution to the problem, which was not unique to telephone service, but applied in the electric, gas, and transportation fields, as well, was for the states to create regulatory commissions which are empowered to limit entry into these fields by the issuance of certificates of convenience and necessity when, in their opinion, the public interest would be served. No one would be permitted to enter the regulated field -- such as to provide telephone service - without a certificate.

The concept that a single telephone carrier should serve a given area developed gradually more as a matter of state commission policy based upon experience than one established by state legislatures in statutes. Of course, this concept was vigorously fought in the courts, but it appears to have been recognized early by the judiciary that this was the only means whereby adequate service can be provided to the public at reasonable cost. There are a number of reported decisions on this point, and I will quote only two. The Pennsylvania Supreme Court in 1919, 108 Atl. 659 (Pa. 1919) commented upon the adverse effect of competition among telephone companies, as follows:

> ". . . Competition may be, and is, very desirable in many lines of business. There are, however, a number of quasi-public enterprises which may be classified as natural monopolies where the duplication of facilities merely results in the placing of an additional burden upon the public by forcing patrons to maintain

> two systems where one would serve the purpose as effectually and at less cost. In this class may be placed the furnishing of gas, water, electricity and telephone service to the public. The argument that competition between rival facilities serves to reduce the price to the consumer is not sustainable logically. The duplication of water systems, for instance, means the expenditure of a large amount of money in the construction of reservoirs, laying of pipes, etc., in turn involving duplication of inconvenience to the public in tearing up streets and making excavations without proportionate benefits. The duplication of telephone systems in a given locality without connection between their lines requires subscribers to install both systems and pay for double service to reach subscribers on but one of the two systems; or, as frequently happens, subscribers maintain both systems when they can reach other users with equal facility on either system. It is useless to argue that the cost of construction of such duplicate system is paid by investors, and the risk of financial failure is theirs, since the burden of finally paying the carrying charges and income to the investors is imposed upon the public with the result that a higher charge on the part of each competing company becomes necessary, due to the division of the partronage of the public."

The notion that interconnection between competing companies would be a desirable solution to the problems of duplication seems to have been generally rejected quite early by the state commissions. In 1917 the California Railroad Commission rejected a request by the City of Los Angeles that two telephone companies operating in the city be required to interconnect their facilities rather than merge. (Re: Southern California Telephone Company, P. U. R. ((1917)) A 989.) The Commission stated at page 1043:

> "Even if some system of recording the various calls, analogous to the annual weighing of the United States mail, could be devised, and if we could imagine that the two telephone companies, continuing rivals by compulsion of public authority, would cooperate fully, freely, and in perfect harmony to secure as great economy in the actual labor of interchanging calls under a system of interchange as would be the case under consolidation, it would still be true that the investment, the depreciation annuity, and at least the general maintenance and operating expenses, would inevitably be greater under a system of interchange than under a system of consolidation, with resulting higher rates to be paid by the people of Los Angeles and adjacent territory involved in the proposed consolidation."

The concept that local telephone service ought to be furnished by a single regulated communications common carrier regulated by the state has been accepted in virtually every state in the Union as the only means whereby efficient and low cost exchange service can be provided.

As a substitute for competition the state commissions were vested with broad authority to review rates; approve either the furnishing of new services or the discontinuance of existing service; and, in general, to prevent the abuses which monopoly might possibly create. The single carrier then authorized by the state regulatory commission to provide service would have certain rights and obligations:

Its obligations:

(1) To serve all who request service.
(2) To render service at reasonable charges.
(3) To serve all without undue discrimination.
(4) To provide service without attaching unreasonable conditions.

Its rights:

(1) To charge a reasonable price.
(2) To protection from competition from the same kind of utility in the same service area.
(3) To attach reasonable conditions before undertaking to give service or while rendering service.

With the development of the telephone industry on a broad interstate basis, it was not long before the concept of a regulated monopoly ran headlong into the conflicting concepts expressed in the Sherman and Clayton Antitrust laws. It became obvious, therefore, that if the telephone system was to develop in an orderly way on a national scale, a special exemption from the antiturst laws would have to be enacted by Congress. In 1921, what is now section 221 (a) of the Communications Act of 1934 was introduced in the Congress as H. R. 6567. The bill provided that if, after affording an opportunity for a hearing, the Interstate Commerce Commission (now the FCC) should find that proposed consolidation, acquisition, or merger of two or more telephone companies would be of advantage to the persons to whom service would be rendered and in the public interest it should certify to that effect; and thereupon any Act or Acts of Congress making the proposed transaction unlawful would not apply. The legislative history of section 221 (a) provides an interesting insight into Congressional thinking regarding the duplication of telephone facilities.

The Report of the House Subcommittee on the bill states, in part:

> "In many cities of the United States, and in rural communities as well, there are dual and competing telephone systems, doing both local and long-distance business. Wherever there are such dual systems engaged in local business patrons of these telephone systems are put to endless annoyance and increased expense. In order to reach all the people using telephones, the telephone patron finds that he must install two telephones in his house and office. This entails additional expense and usually results in inferior service over both systems. Double systems of cables, wires, and conduits burden the streets and highways and the additional expense of installation of central exchanges greatly increased the burdens which must be borne by the telephone users.
>
> "So thoroughly is this appreciated that in many States public utilities commissions have recognized by their rulings the principle that the best telephone service can be rendered by one company, under proper regulation as to rates and service. There is nothing to be gained by local competition in the telephone business. Therefore, consolidations of telephone facilities are today generally encouraged. . . ."

The Federal Communications Commission brought to an end in 1943 one of the last instances of duplicate telephone service in a major city. In its decision approving the acquisition of the Keystone Telephone System in Philadelphia by the Bell Telephone Company of Pennsylvania, the Commission stated in pertinent part (In the matter of New Jersey Bell Telephone Company and Bell Telephone Company of Pennsylvania, 9 F.C.C. 261, 267, 270, ((1943)):

> ". . . Users within the competitive areas are inconvenienced by the necessity of having two telephones in order to obtain comprehensive service, and of selecting between such telephones in calling other persons who subscribe to only one of the services. This dual service involves duplication of line and line structures, central offices, and telephones, and duplication of costs for maintaining and operating separate facilities whose function could be served by a unified plant.
>
> ". . . acquisition by Bell of Pennsylvania of the properties of Keystone will permit elimination of unnecessary and uneconomic duplication of

> telephone plant and maintenance and operating expense, and should promote greater convenience of telephone use and efficiency of telephone service."

And at page 270, the FCC concluded as follows:

> "Upon the entire record herein, we find, for the purposes of this proceeding, that disadvantages to particular users which may result from the program of acquisition and consolidation proposed by applicants, are outweighed by the benefits to the general public to be served and the advantages of increased efficiency, convenience, and comprehensiveness of service which may be expected to follow from acquisition by . . . Bell of Pennsylvania of the properties of Keystone."

In many other cases, the FCC has approved telephone company mergers and acquisitions, often with little comment. See, for example, In the Matter of The Bell Telephone Company of Pennsylvania and Pennsylvania Telephone Corporation, 4 F.C.C. 633 (1937); Re: Wisconsin Telephone Company, 29 P. U. R. 3d 152 (FCC 1959); and Murphy v. United States, 252 F. 2d 389 (7th Cir. 1958).

The same considerations militating in favor of a consolidation of telephone carriers apply also in the telegraph field. Despite the policy established in the Communications Act of 1934 in favor of competition in the telegraph field, the FCC itself, in 1935, recommended that the Congress enact legislation permitting the consolidation of telegraph companies. That recommendation, which was not enacted into law, was revived in 1939, as the condition of the domestic telegraph companies worsened. A Senate investigation into the telegraph industry was commenced in June 1939; and in 1941, after lengthy hearings, a bill was introduced to permit both domestic and international telegraph mergers. Hearings were held on the bill in 1942, but the Navy Department, which had previously supported a merger of the international telegraph carriers, objected to enactment of the legislation during war time. By 1943, however, the problem of Postal Telegraph had become desperate. It was hopelessly in debt, and permissive legislation was quickly enacted to permit Western Union to purchase the Postal Telegraph assets. The merger of Postal Telegraph and Western Union followed, and the idea of regulated monopoly rather than competition as a means of strength came to the fore. (See Telecommunications -- A Program for Progress: A Report by the President's Communications Policy Board, Washington, 1951, pp. 91 and 153.)

The United States Supreme Court has had occasion to pass upon duplication of facilities in the international communications common carrier industry. In Federal Communications Commission v. RCA Communications, Inc., 346 U.S. 86 (1953), the court had before it for review an action of the FCC approving an application filed by Mackay Radio and Telegraph Company to provide new radio telegraph services between the United States, Portugal, and The Netherlands. These new services (or "circuits") would be in competition with circuits provided by RCAC. The Commission found that a grant of the Mackay application would increase "overall competition for telegraph traffic generally," and introduce more effective radiotelegraph competition. The Commission concluded that duplicate facilities should be authorized because it found competition to be "reasonably feasible" in that instance, and because the Commission assumed that there was a "national policy in favor of competition." Justice Frankfurter, who wrote the Court's majority opinion reversing the Commission, stated that there is no national policy unqualifiedly favoring competition in the communication industry. He pointed out that it is only in a "blunt, undiscriminating sense that we speak of competition as an ultimate good." (346 U.S. at 92). He went on to state that the concept would have to be applied to each particular fact situation to determine whether the effects of competition are beneficial. Justice Frankfurter stated further,

> ". . . Indeed, as to the industry before us in this case, there has been serious qualification of competition as the regulating mechanism. The very fact that Congress has seen fit to enter into the comprehensive regulation of communications embodied in the Federal Communications Act of 1934 contradicts the notion that national policy unqualifiedly favors competition in communications. The Act by its terms prohibits competition by those whose entry does not satisfy the 'public interest' standard. In this field, the reason for such restriction undoubtedly lies primarily in the limited availability of international communication facilities, recognized in a series of international conventions. Other considerations may also have applied: Congress may have considered the possible inconvenience to the public of duplicate facilities -- as would more clearly be the case with telephones -- or the possible inadequacy of the demand for international communications to make more than one enterprise economically or socially desirable. Whatever the reasons, they are not for us to weigh; it is for us to recognize that encouragement of competition as such has not been considered the single or controlling reliance for safeguarding the public interest." (346 U.S. at 93).

Thus, the Supreme Court recognized, and applied, the same general philosophy to the overseas service that the FCC and the state courts had applied to local service.

If there is any lesson to be learned from the history of state and Federal regulation of telephone systems, it would appear to be that great care ought to be taken in developing a national telecommunications policy not to create the same service problems which developed a half century ago. Instead of a simple duplication of wire facilities there is today the potential duplication of plant created by communication satellites; terrestrial microwave radio relay facilities; buried cables and submarine cables with their attendant problems: rate wars, the requirement for customers to deal with more than one company for multiple services; technical incompatibility of equipments, inconvenience to subscribers unable to reach a maximum number of customers on a single system; excessive overhead costs created by duplicated management structures and complex billing procedures; planning difficulties created by the lack of a well-integrated management structure as well as the requirement for compromise in development of standards for new equipment; and the difficulty of attracting capital created by loss of potential market.

It would seem appropriate to conclude this paper by citing the views of an outstanding economist on the role of competition in the communications carrier industry. In his book The New Industrial State (Houghton Mifflin, 1967), John Kenneth Galbraith relates in a comparative way the development of the transportation and communication industries in the United States. He describes in some detail the way in which the various modes of transportation developed, and the influence that the size and form of business organization, as well as the degree and form that Government control had on the pace and scope of development. For example, Professor Galbraith points to the essentially local development of urban and interurban transportation systems, which could have developed into efficient intercity and interregional systems with joint use of rights-of-way, terminals and other facilities, as appropriate. Development of the urban and interurban transportation business along these lines would have enabled it to compete more effectively with the automobile and airline industries in promoting the demand for its services, and would have given the enlarged system a much broader source of capital.

Professor Galbraith then describes development of the railroad and telecommunications service industries, as follows (pp 357-385):

> "The railroads under a different system of regulation, followed their own rather special pattern of development.[1/] Each part provided a fraction of the total services of moving people locally and regionally; none, in consequence, could plan the entire service. None had appreciable authority over prices, use of service, capital supply or labor supply. None had a developed technostructure. In an industry which required planning, none of the requisites of planned performance were available. It is not surprising that the results have been singularly bad.
>
> "Although no parallels are exact, it is interesting to contemplate the different development of telephone service. This makes use of an old form of electronic communication. As in the case of the railroads and urban transit, alternative technology has been massively subsidized by the Federal government for military purposes. But in the telephone industry one giant corporation had planning authority coordinate with the whole task. It embraced both local and long-distance service. It had resources for competitive technical development and also for seeking government underwriting of such development where, as is usually the case, this could be justified by military application. The scale of A. T. & T. accorded it substantial authority over rates; it could enter actively on the management of the demand for its services; it had control over its capital supply; size combined with technological advance have enabled it to plan its labor requirements, keep them within the prospective supply and maintain authority over its labor force.
>
> "Had local telephone service been provided by one or more companies in each city, town and hamlet; had all these rates been subject to local regulation and influence; had long-distance service been supplied

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[1/] Most American railroads have had a pattern of development different from that of the firms of similar size in the industrial system. There is no similarly developed technostructure; for most of their history there has been no similar technical dynamic; there has been no similar capacity for taking control of prices, demand for the services, labor and capital supply and the other requisites of successful planning. Regulation, prohibitions on mergers and diversification of activities and a tradition of routine, highly ritualized management of low technical aspiration and competence have all been factors. In Japan, France, Canada and other countries where there has been one national system or one or two dominant systems, the industry has had greater control over the requisites of its planning and its comparative performance and survival value have been much better.

by numerous separate companies, only loosely coordinated with the local service; had there been little or no research or technical development anywhere in the system; had the local units been strongly dependent on external authority -- municipal government or local banks -- for capital; and had there been no planned provision for labor supply or substitute technology, it seems unlikely that telephonic communications could have survived in any very useful form.[2] That they flourished, none can doubt, is owing not to a mindless response to a free market but to the subordination of the market at all points to comprehensive planning."

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[2] As a partial demonstration of the point, it has been suggested that, in the absence of automatic transmission of calls, it would require approximately the entire female working force of the country to handle current traffic.

APPENDIX B

Discussion of Innovation and Vertical Integration of Telecommunications

The Task Force Report places major emphasis on the importance of accelerating technological innovation in telecommunications systems and services. It considers United States leadership in telecommunications science, technology and service as a major goal of national policy. In support of this goal, it recommends the promotion of experiment and innovative techniques as a prime objective. An underlying theme of the Report proposes that competition in many different forms can play an important role in the acceleration of innovation. The role and history of competition in telecommunications is discussed in another paper associated with this dissent.

The Report, in several places, indicates that innovation is proceeding apace, yet there appears to be an underlying implication that the present rate of innovation is not optimum and that acceleration of innovation would produce improved services at lower costs. These conclusions are unsupported by research, factual investigations, or findings, and seem based on theoretical postulates, rather than on the actual practical experience of the industry. The statistical record of invention and innovation of the industry is impressive and should be compared on a factual basis with performance in other industries. Enclosure 1 lists a few of the major innovations.

The Report discusses at length but purports to be inconclusive on the merits of manufacture of equipment by the carriers (vertical integration), and reaches no conclusion on this subject in Chapter VI dealing with the domestic carrier situation. It does, however, propose substantial restrictions against manufacturing on the part of the proposed merged international entity in Chapter II.

In considering innovation and vertical integration as applied to the telecommunications systems of the United States, it is necessary to recognize that they are not separable, but are directly interrelated and continuously interacting. Further, it is necessary to recognize the institutional motivations which condition and control management in this industry. The primary orientation and the greatest rewards from accomplishment are derived from the provision of services -- telecommunications services ranging from efficient, expeditious, economical handling of individual local and toll telephone calls to providing the most efficient, flexible, distortion-free network for national distribution of color television programs.

If we consider innovation in telecommunications as the introduction of new technical equipments, subsystems, or components in the most effective, efficient, economical manner to maintain and improve the performance of the system, we cannot separate it from this primary objective of providing efficient, economical telecommunications services. These service objectives can only be achieved in a system as large and complex as the integrated telecommunications system through the conduct of basic research, applied research and development, the design and manufacture of components and subsystems, and the installation and maintenance of equipment -- all within the framework of an overall system engineering concept aimed at maintaining and improving the total capabilities of the system. This is the essence of the telecommunications institution in the United States today. The principal carrier provides practically all the long distance telephone services; provides local services to over 80% of the telephones in the United States; and by combining the transmission requirements of the telephone services with those for the leased services, including television program distribution, has achieved the tremendous economies of scale which have reduced the transmission costs for all services by nearly 100 to 1 in the last three or four decades.

Considerations of innovation and the new techniques, components and subsystems that comprise innovation are dependent upon system engineering considerations that guide and insure the continued integrity of the entire telecommunications complex. With over a trillion components in the present nationwide system and a requirement for maintaining continuity and progressively improving the performance of this system, innovation becomes an extremely complex matter. The conduct of components design and manufacturing, installation, operation, and maintenance become integrated parts of the total process of evolving the system over time. Manufacturing is made merely a tool of the overall system engineering effort to continually upgrade the system and reduce or maintain the costs or the rates for its services. Manufacturing, installation, and maintenance of equipment become merely means to an end and not ends in themselves.

The secret of the success of the American telephone service is not in the application of technology to technical systems, but in the management system that underlies the operation. The concept of one organization which performs advanced scientific research and development necessary to the production of new materials, designs new components, new equipments and new systems -- all as parts of a single, growing overall system -- is the secret of success. This organization provides for long-range systems engineering and for the installation, maintenance, rehabilitation and modernization of the parts of the system as the art progresses making possible the kind of services at the costs we enjoy today.

The validity of the concept of vertical integration and its contribution to systematic, effective innovation as demonstrated in the excellence of the resulting telecommunications services is demonstrated in a number of different systems. Vertical integration is a factor in the success of not only AT&T but of General Telephone and Electronics and United Utilities in the United States. It is also characteristic of the telecommunications organizations of Canada and Sweden which are considered to provide services and economies quite comparable to those of the U.S. telephone companies. Further, the British Parliamentary Commission that is shaping the reorganization of the Post Office into a corporation has recommended consideration of vertical integration in the organization of the British Post Office to improve its efficiency in providing telecommunications services, citing specifically the accomplishments of the Bell Telephone Labs-Western Electric combination in the United States as an example.

Tampering with the basic institution of vertical integration of the communications industry should only be considered after the most exhaustive examination of the question, recognizing that vertical integration is fundamental to orderly, effective, economical innovation of the services.

APPENDIX B

Innovation in the Communications Industry

The reputation of the United States telecommunications industry for scientific discoveries, the invention of new devices and systems, and innovation in telecommunications service is worldwide.

Twice industry scientists have won the Nobel Prize in Physics: for demonstrating the wave nature of matter (1937) and for the discovery of the transistor effect (1956).

From the complete and systematic analysis of amplitude modulation in 1915 which led to the development of single sideband transmission in the early 1920's, through the invention of the feedback amplifier to the development of the transistor, the telecommunications companies have made monumental contributions to technology.

Historically innovation in telecommunications included:

the conception and development of information theory;
the development of the basic structure of network broadcasting;
pioneering sound motion pictures;
creating the new science of radio astronomy;
development and construction of the first electrical, digital computer;
the first public demonstration of television;
the development of hi-fi sound reproduction;
the introduction of microwave radio and coaxial cable systems;
the development of principles that opened the way to worldwide communication by satellite.

Recent important innovations include:

the development of the transistor;
the development of traveling wave tubes;
the development of thin film techniques;
major contributions to the development of the laser;
Touch-Tone or push-button dialing;
the development of commercial electronic switching for central office and business customer use;
development and demonstration of the Picturephone

the development of the 720 channel transistorized undersea cable;
the first commercial digital transmission system, the T-1 carrier
employing Pulse Code Modulation (PCM);
improved microwave transmission systems (the TD-2B and the
TC-3);
the L-4 coaxial cable system (providing 32,000 two-way channels);
direct dialing of overseas subscriber telephone calls; and,
a variety of data communication terminals for computers and
other business machines (including the type 604 enabling
doctors, hospitals and medical research people to transmit
electrocardiograms over the telephone).

The L-5 coaxial transmission system, recently announced for installation between St. Louis and Los Angeles, will eventually provide at least 90 thousand two-way telephone channels. Initially using analog transmission, the capacity can be converted on an incremental basis to digital transmission.

The announcement that a wave guide transmission system is ready for production makes available the equivalent of 234 thousand channels on a trunk route when needed.

Transmission capabilities of this magnitude, coupled with the development of Pitcurephone, make a "see while one talks" service possible, and it awaits only market development for extensive application.

This record of innovation is the mainstream of progress in the field of telecommunications and in the entire art and science of electronics. These advances in electronics have been essential to all phases of modern telecommunications, have made fundamental contributions to advances in analog and digital computers and even to the exploration of space. A somewhat mundane illustration of the progress is the fact that the first coast-to-coast long distance telephone call cost $20.70 (1915) while the minimum rate today is 75 cents.

APPENDIX C

Comments Concerning Chapter II "Organization of the United States International Communications Industry"

Chapter II considers the problems of United States international telecommunications services. These derive essentially from the multiplicity of carriers (formerly primarily message telegraph carriers); the impact on these organizations and their services of rapidly advancing technology and expanding services, particularly the introduction of communications satellites into the international telecommunications structure and the growth of private line services; and the progressively growing importance of the institution of international telecommunications as a factor in the foreign policy and an element of the overseas operations of the United States.

The chapter recommends consolidation or merger of the transmission functions of these international operations, together with consolidation of bulk message handling and switching functions to the extent that economies of scale make merger economically justifiable. The chapter does not consider in any depth the critical problems of overall domestic-international system integrity, the importance of improving our international telecommunications organization to deal more effectively and efficiently with the international telecommunications services of other nations, and the needs for major improvement in the contribution that telecommunications as an institution should make to foreign policy and the efficiency and effectiveness of foreign operations.

These omissions and the primary emphasis on economic and legal aspects of the problems result in the recommendation of conditions to be imposed on any merged international entity which could largely defeat the purpose of such a merger and result in rejection of the proposals by the industry. In addition, they would serve to transfer many of the problems we are trying to resolve in the international services to the domestic portion of the industry.

Most of the proposed conditions are predicated on the objective of contriving the maximum opportunity for competition in these services. First, the chapter in a number of places discusses or supports the belief and conclusion that a competitive service to the public can be provided in international communications by permitting any entrepreneur to lease channels from the merged international carrier to provide any kind of telecommunications service which the system can sustain and he can sell to the general public. There is the inference that this type of function would provide a viable business which the international carriers might wish to sustain after being divested of transmission and directly related operational activities.

One of the objectives of merger is to simplify the present complex structure of retail services provided by the international carriers and to permit a systematic, rational and efficient working relationship between the originators of telecommunications traffic (of all kinds) in the United States and the correspondents -- government departments or government corporations -- on the other ends of the international routes. The operationally rational and technically efficient system would provide that AT&T and Western Union (which own and operate all the domestic circuits providing access to and from the international systems) provide these services and that the new merged carrier maintain the service arrangements with the foreign correspondents.

Second, the chapter in discussion and by recommendation proposes to restrict the opportunity of the merged international carrier to engage in manufacturing which can be in any way provided by the marketplace. That is, it proposes to prohibit vertical integration not only in the procurement of space hardware (where for the foreseeable future the new entity should not attempt to develop a capability), but, in effect, in all other areas of communications equipment and system manufacture and procurement. We do not consider that this is a sound restriction on the new entity as effective, economically efficient innovation in telecommunications is progressively more dependent on the integration of research, development, system and components design, manufacturing, installation and maintenance, under single management. The new carrier should not be disbarred from the beginning from every opportunity to avail itself of the technical advances and operational efficiencies of modern telecommunications management practices. An associated paper discusses innovation and vertical integration in greater detail. Here again, these proposed restrictions on the carrier are the result of concentration on the objective of competition rather than the primary objectives of efficient, economical, progressively expanding and improving telecommunications services.

Third, the chapter recommends restricting the new international carrier to providing only international services. Since the new carrier would absorb all the functions now performed by the Communications Satellite Corporation, such a condition would prohibit, for example, the satellite systems portion of the carrier, either independently or working through

INTELSAT, from providing the space segment or participating in the ground environment of any domestic communications satellite service. This recommendation again is conditioned by the concentration on competition as an end in itself, because the report reflects the desire to preserve the option of establishing "competing" domestic communications satellite services. This question need not be decided at this time. Suffice it to say that within the decade international telecommunications services by satellite will be originated at many earth stations throughout the United States; such stations by reasons of economic efficiency, operational effectiveness and frequency conservation should be handling both domestic and international traffic, and the merged international entity should provide the space segment for these services as part of an improved global telecommunications network.

Fourth, discussion, inferences and recommendations imply even greater participation in the management of the proposed merged international entity by the Government than now prevails in relation to the Communications Satellite Corporation. The report assumes that the duties imposed on the Executive Branch by the Satellite Act of 1962 with regard to Comsat would continue or would be strengthened if Congress authorizes a single international carrier. It also contemplates substantial augmentation of Executive Branch capabilities to engage in economic and engineering analysis in the field of communications policy, including surveillance of investment decisions.

The report lacks a clearcut recommendation that the new entity should be a telecommunications service corporation responsible for providing all the international telecommunications services (except those of the U.S. Government) exiting or entering the United States. It should be truly a private corporation without Government members of the board or other arrangements which could inhibit its freedom to perform as a public utility serving the public, commerce and the Government, and subject to regulation as any other public utility. International telecommunications activities are so intimately associated with foreign policy and foreign operations of the U.S. Government, that Executive Branch participati in guidance, promotion and assistance to the new carrier will be required. However, this participation should not usurp management prerogatives of the new carrier. Effective regulation by a strengthened FCC should assure the operation of this new entity in the public interest.

APPENDIX D

Comments Concerning Chapter VI "The Domestic Telecommunications Carrier Industry"

Chapter VI treats the domestic telecommunications services provided by the Bell System, General Telephone and Electronics, Western Union and over 2,000 independent telephone companies. These companies operate about $40 billion in telecommunications plant and serve over 100 million telephones in the United States.

Appendix A discusses the question of competition as it relates to these systems and Appendix B considers the interacting factors of innovation and vertical integration (captive manufacturing) which apply to the operations of these companies.

Collectively these companies operate the largest single integrated system of any kind in the world. This system provides the domestic telecommunication circuits and connections with overseas circuits to meet all needs of the Government, particularly those of the Departments of State and Defense, NASA, and other agencies having critical telecommunications requirements.

Millions of dollars have been spent by Government and industry in assessing telecommunication requirements for support of national defense, internal security, and natural disaster operations considering a wide range of emergency conditions, including nuclear war. These studies have resulted over the years in another considerable expenditure of funds on a continuing basis for new transmission and switching systems and the rearrangement of national networks to meet essential emergency operational, diplomatic, administrative and logistical requirements. Requirements derived from the findings of these studies and their application to systems design and rearrangement have stressed the achievement and maintenance of system integrity and survivability throughout the nationwide common carrier network. System integrity in the national security sense means that the overall system with all of its redundancy should be instantly available for restoration of services by rerouting vitally important communication links and the immediate initiation of massive and integrated efforts to repair or replace damaged or destroyed elements of the system.

The studies include an extensive series of Survivability Analysis projects which have been pursued by the Department of Defense. Each major international incident or action from the Korean War to Quemoy-Matsu, Lebanon, the Cuban Missile Crisis, and the present action in Viet Nam has been analyzed for its lessons for communications. The Cuban Missile Crisis proved beyond doubt that separate communication systems, tailored to individual agency needs, could not be relied upon in a crisis to meet vital national requirements. President Kennedy found it necessary to take extraordinary steps during the crisis and, on August 21, 1963, established the National Communications System to bring about a unified system to provide necessary communications under all conditions of emergency. The Alaskan Earthquake, Hurricane Betsy and the New England Power Blackout had further important lessons for the survivability of communications and their vulnerabilities. We must not ignore these lessons.

In December of 1964 President Lyndon B. Johnson issued the current National Plan for Emergency Preparedness. When promulgating the document, the President said:

> "The preparedness measures outlined in the National Plan for Emergency Preparedness are essential. They must be fulfilled. As President, I pledge that those responsibilities of the Federal executive branch will be carried out, and I urge the Chief executives of State and local governments, the leaders of labor and industry, and all Americans to accept and fulfill their particular roles."

Contained in the National Plan for Emergency Preparedness is the following Presidential policy:

- "The telecommunication resources of the Nation would be available for use by the Government in time of emergency, contingent upon the nature and extent of the needs of the public welfare for continued service. In addition, there will be a single, unified communication system for use by the Federal Government under any conditions, normal or otherwise."

- "It is of the utmost importance that the network characteristic and capability of the telecommunication system be preserved to the greatest degree possible during a national emergency."

> "So that there would be communications for performance of essential governmental and public services in an emergency, it is necessary to: Provide reliable means of communication among levels of government and between government and the people; Provide for maintenance of communications essential to operations of elements of the national economy; Establish and prepare to enforce priorities on use of facilities and systems."

The President summed up succinctly one of the Nation's important communication objectives in the document when he stated that "the objective of the communication program is to create a communication system capable of surviving attack and adequate to conduct and coordinate Federal, State and local civil defense activities" (underlining added).

The foregoing policy and objectives indicate the importance that the President has placed upon the readiness of telecommunications to meet emergency requirements and the recognition that one system -- a nationwide system -- is essential to meet these needs.

This policy, when considered together with Bureau of the Budget Circular A-76 and the 21 August 1963 Presidential Memorandum, provides firm and far-reaching guidance for activities in the area of national telecommunication system design, development and procurement. Within the framework of this policy, the communication common carriers perform an indispensable role.

This important aspect of our national telecommunications policy has not been described in the Task Force Report and is an important national objective. Over-emphasis on the objectives of rapid innovation and competition in the domestic networks could have serious implications for the national defense and national security functions of the domestic carrier services.

In order to be able to meet most effectively the needs of national security, the telephone companies have established and regularly exercise a sophisticated network control system to develop circuit and route restoral procedures and methods and to manage restoral operations in case of emergency. This system is organized around national policy providing for pre-emption of circuitry from any non-essential user for purposes of national survival and defense needs.

The complete network of the common carriers has been designed to meet requirements for national defense and security (e. g. , by-passing of target centers, hardening of cables, multiplicity of routing, and conditioning for use of residual capability subsequent to system degradation, disruption and partial destruction). Realization of such capability on a nationwide basis depends upon integrated management, and the engineering and operation of all circuitry, private line and switched, to rigid and universal standards.

The existence of this integrated national network has made possible the domestic portion of the AUTOVON System and the Federal Telecommunications System (all leased) which provide the core of the National Communications System (NCS). AUTOVON is being extended overseas with a mixture of Government-owned and leased facilities to provide the nucleus of the worldwide NCS. The NCS furnishes the communications portion of the worldwide National Military Command System, the nerve system of our national security.

If we examine the total long haul domestic telecommunications capabilities against the criteria of maximum redundancy, reliability, capacity and flexibility to provide communications for national command-control, civil defense, reconstitution of the economy, and other vital needs in case of a major national emergency, we are led to the inescapable conclusion that the larger, the more redundant and the more flexible the network under unified centralized control, the better off we would be in case of natural disaster or military attack. This leads to the further conclusion that efforts to devise means for fragmenting domestic long haul communications to provide competition, exploit new technology independent of the existing network or to provide means of accelerating innovation would be counter-productive in terms of our national security requirements.

Whether long haul microwave transmission facilities are constructed with public funds or stockholders' funds, they require frequencies which are a national resource belonging to the public and should be considered for their contribution to strengthening the overall national telecommunications system. The role and capabilities of private and specialized carrier transmission facilities should be examined to determine whether and to what extent they can be interconnected with the integrated common carrier network.

Chapter VI proposes a methodology for introducing competition into the domestic long haul service by subdividing service into two parts --

the public message switched network and the private line system -- when, in fact, these are inseparable parts of the integrated system. This device has not been examined in sufficient depth to develop the potential impacts and interactions on the organizations, the services they provide, and costs to the users. Reliance is placed largely on competition to take care of all these questions.

In order to clear the way for competition to become effective and, at the same time, to minimize the potentially serious harm to the network, the Chapter encourages departure from the present system of rate averaging so that established carriers could meet the threat of new competition. In our judgment, there has simply not been adequate time for examination in depth as to the consequences which could result. If these strategies are to be really effective in a large and substantial way, there surely must be large-scale growth of an unwieldy host of rates all over the country and the progressive deterioration of a rate structure philosophy which has been established with great effort over many years. This rate structure has served satisfactorily to produce excellent service at rates which have been uniquely stable during the past 20 years of general inflationary pressures and devaluation of the dollar. In the area primarily affected by the proposals of Chapter VI, i. e., the long haul services, the rates have been significantly and progressively reduced and promise further significant reductions in the future under present practices. Further, notice should also be taken of the increases in service which have paralleled either maintenance or reduction in rates. The marginal cost pricing concept which is the basic methodology proposed for proliferation of the rate structure is discussed in greater detail in Enclosure 1 of this Appendix.

In our judgment, the impact of these proposals on the Western Union Telegraph Company or the independent telephone companies (more than 2,000) which service about 17 million telephones in the United States (more than the total telephones in any other country in the world) has not been adequately studied or described because of the pressures of time. The independent companies provide service to telephones in over 50% of the geographic area of the continental 48 states which is franchised for telephone service. In addition, they provide all the service in the states of Alaska and Hawaii and to Puerto Rico. The independents serve 10,945 telephone exchanges compared to 6,763 for Bell. Consequently they have a much higher percentage of thin routes and marginal operations than does the principal carrier. Anything which threatens the present rate averaging system (for private line services as well as message traffic) or threatens the independents with competition on their few heavy routes or into their franchised service areas can have a substantial impact on their financial viability.

It should be made clear that our position does not preclude establishment of private line systems if technical standards and interconnection arrangements are adequate. Many of these arrangements are inadequate at the present time. From a practical point-of-view, it will be difficult to achieve the adequacy required and still achieve the competitive objectives. We strongly endorse the Satellite Pilot Program which, if successful, would introduce satellites as an important integral part of the domestic long lines system.

The major conclusion to be emphasized is that great care needs to be exercised in promoting measures which have not been most carefully studied as to their effects on user costs, quality of service, system integrity, and effective support of state and federal needs in case of natural disaster or military crisis. Such studies can only be successful and adequate if they are made with the closest collaboration with the industry.

APPENDIX D

DISCUSSION OF MARGINAL COST PRICING CONCEPT
AS ADVOCATED IN
DOMESTIC CARRIER PAPER OF TELECOMMUNICATIONS TASK FORCE

There is a conventional sense in which the concept of marginal cost pricing is used. Under this concept the "marginal cost" of a service are those investments and recurring charges associated with the provision of one additional unit of service or plant item -- this is literally, cost "at the margin." In an industry like telephony, with its vast proliferation of facilities, routes and equipment types, this concept of marginal cost is neither physically manageable nor administratively tenable. In a service classification such as private line telephone we are dealing with something in the order of 10,000 point-to-point routes, some of which will have as many as fifteen types of physical facilities interconnecting these pairs of points. On some routes, as a function of time, existing plant will have large spare capacity over many facilities. The cost of one additional circuit, with carrier in place, will be literally zero. An adjacent route possessed of no spare facilities may find it economically necessary to supplement existing VF cable with a microwave or coaxial facility with heavy common costs -- all of which would be assignable to the marginal unit cost. Assuming it were practicable to identify such costs, the polygot result would not be meaningful. The pace of growth and change in the industry is such that if such costs were identified they would be obsolete before the summary were drawn.

In a joint cost industry with overwhelming complexities of communications supply, the use of pure marginal analysis cannot be employed in a meaningful way. Regardless of approach, there is a vast array of selective averaging allocation among service classification involving highly arbitrary assumptions. It may be sufficient to enumerate some of the problems. The definition of the output unit, the specification of the output level at which marginal cost would be measured, the selection of the size of the increment that would be employed to approximate the margin, the assumptions relating to the quantities, qualities and distribution of facilities at the time of measurement, the assumptions of the timing of incremental additions, the separation of technological effects from scaler effects on costs constitute only a portion of the problems that arise. Telephony operates in a dynamic environment where increments of new investment are always being added to existing plant, where technology and demand are changing over time. There is no such thing as a long-run marginal cost figure for a service or even a long-run marginal cost function. There are families of marginal cost functions with varying elasticities of supply at any specified output level, depending upon the composition and the stock of capital inherited from the past, the investment possibilities for the future, and whatever assumptions of demand and technology that the cost analyst chooses to make.

The Task Force paper would approve the Bell pricing proposal. Under this proposal the cost of all inefficiency is treated as unallocable and thus borne primarily by the service supplying the residual revenue requirements. These inefficiencies arise from several sources: they spring from errors in market forecasts, mistakes of past investments or operating inefficiencies. If the Commission is to provide a regulatory function, it must be in a position to compare, on a continuing basis, the forecasts and assumptions upon which the marginal calculations are made with the reality as they develop. The Bell proposal ultimately becomes an evaluation of carrier subjective judgments -- judgments which cannot be tested until the events which motivated their appearance have passed.

The only costs which are "manageable" in the telephone industry -- and manageable, in the sense that the common carrier has access to defined records of such costs, and the regulator has the competence to review such records -- are average costs. However, average costs can be construed in the marginal sense. If we wish to encourage competitive response by the common carrier, he should define these marginal costs over routes or service classification for this existing, most efficient existing plant. Plant records of the associated Bell Companies and Western Union show this investment and associated overheads by type of facility. Line and trunk records show facility capacity. The memorandum records for the central office account show by building location and office unit the investment for each defined switching system. Again, line cards show the line capacity, theoretic call-carrying capacity, working lines and trunks. The carrier would be given discretion to utilize his average investment for low cost switching system capable of providing the necessary service for marginal cost purposes.

THE UNDER SECRETARY OF COMMERCE
WASHINGTON, D.C. 20230

December 18, 1968

Honorable Eugene V. Rostow
Under Secretary for Political Affairs
Department of State
Washington, D. C.

Dear Gene:

As you know, I have stated my position on the main issues in the chapters of the Task Force Report during the course of the work and in earlier communication commenting on various drafts. I have now reviewed the final Report, and, as indicated in my letter of December 6th, submit these summary comments.

The most important contribution of the Report is the recommendation, which we strongly support, for a new policy source in the Executive Branch of the Federal Government (i) to conduct the necessary research and studies, (ii) to allocate the scarce spectrum resource on a rational basis, and (iii) to provide policy guidance to the FCC. One of the most fundamental needs which the new source must meet is that of providing adequate continuing technical and economic information upon which to base valid judgment affecting allocation and use of the electromagnetic frequency spectrum. We also endorse the basic recommendation for a single new U. S. entity for international communications (though we are concerned about detailed attached conditions), and the pilot program for domestic satellite applications.

We have earlier expressed the view that the chapters on domestic common carriers and television broadcasting are inappropriate for the report and were not requested by the President's Message. Our comments on these and other chapters are given below.

Chapters VI and VII

After careful examination of the President's Message, I am persuaded that we were not called upon to make the remarks and recommendations contained in the "Domestic Carrier" and "Broadcasting" (now labeled "Future Opportunities for Television") chapters. Beyond the question of relevance, I do not agree in substance with most of the language and most of the recommendations in these two chapters. Finally, I am fearful that the inclusion of this material may prejudice what I consider to be the more important recommendations of the Task Force, including what we all agree is the single most significant recommendation -- the need for a new policy source in the Executive Branch of the Federal Government (i) to conduct the necessary research and studies, (ii) to allocate scarce spectrum on a rational basis, and (iii) to provide policy guidance to the FCC. In short, I feel that the issues dealt with in Chapters VI and VII are not susceptible of one-time solution but, rather, are best left to the continuing scrutiny of the new and strengthened Federal entity.

In the way of specific examples of our problems with "Domestic Carrier," I do not think the Task Force is correct, on both jurisdictional and substantive grounds, in making the recommendations it does concerning the precise privileges which should be afforded to private line applicants, the future of Western Union and the public message service business, and the policies the FCC should follow in rate-making proceedings. I am opposed to the discussion of the relationship of Western Union to ATT. As I read that discourse, the Task Force finds it has not had the time or capacity to make recommendations for restructuring this relationship and recommends the issue for further study. Under these circumstances, again with reference to the scope of the President's Message as I read it, I feel the issue is best left alone.

My exceptions to Chapter VII are in similar vein. For example, I do not feel any profit in commenting on the question of copyright liability for CATV broadcasters. Nor am I comfortable with recommendations concerning the FCC's duopoly role as applied to cable TV or other alleged "conflict of interest" or "media domination" questions. Indeed, with regard to future opportunities for television, more appropriate grounds for introducing the discussion of cable television would have been found in its spectrum conservation aspects and its technical advantages over broadcasting for improved picture quality.

Chapter II

I am not prepared to subscribe to the recommendations contained in Sections IV, V, and VI.

Section IV discusses certain conditions which the Task Force feels should apply to the new "single entity" in the international communications field. Section IV briefly particularizes these conditions in the context of the principles Congress should look to in implementing legislation. Most any recommendations concerning conditions to be applied to the new international entity are, at best, premature. Even armed with the Task Force recommendations for a new international entity, it cannot materialize for some time. I fail to see how the Task Force can forecast the conditions under which the new entity will, if it ever does, come into being. Consequently, I am fearful that conditions suggested at this stage, to come into effect at some later time, could be unsuitable in whole or in part to the situation as it then exists. It doesn't seem prudent to attempt to reach this far in the future on the basis of our present, necessarily imperfect, knowledge. Frequently, even too rigid a restriction to *transmission*, without adequate provision for *switching*, possibly even on a message basis, could unduly restrict loading and the attainment of the efficiencies hoped for in such new entity. The Report, incidentally, speaks of "selling bandwith." More precisely, it is information-carrying capacity which must be considered, which involves not only bandwidth, but also signal-to-noise ratio. Moreover, I understand that some transmission concepts for the future would probably affic in digital units -- bits per second -- without tendering andwidth directly. Such examples merely illustrate the risks of attempting to spell out detailed conditions for the future of the new entity.

In Section VI, my objection is to the language on page 50 which states that the Task Force favors Congressional action to divest the carriers of their stock in Comsat and their representation on its Board of Directors. I fail to see why this recommendation is necessary nor am I acquainted with the reasoning behind it. Moreover, as in the case of recommendations in Chapters VI and VII, I do not feel that it is within the scope of our writ.

Chapter III, IV and V

I am, as indicated previously, prepared to subscribe to these chapters, especially the basic recommendation on the future of INTELSAT, and for the pilot program for domestic satellite applications. In this case, the more specific recommendations for the conduct of the pilot program are not inappropriate; if the program is begun promptly, it will undoubtedly precede the establishment of the new federal policy source. We concur in the proposal and terms for Comsat management of the program, on the assumption that the portion on interference measurements and sharing criteria would be government managed.

Resolution of this problem is a government responsibility and clearly has international ramifications. The need for an objective study, external to the parties at dispute between satellites and terrestrial microwave systems, seems manifest. Established facilities and competence for such studies are already set up in the government in the central program of research and services in radio wave propagation and systems at Boulder, Colorado, under the Institute for Telecommunication Sciences (formerly CRPL) of the Environmental Science Services Administration.

Chapter VIII

I continue to feel that the recommendations in Section V are overly specific. Moreover, I believe the discussion of economic factors as applied to frequency allocation, set forth in Section III B, should be recast to contemplate further study of the issue by the new policy source. In my opinion, there are alternatives to a license fee arrangement and problems with the entire question of economic factors which are not sufficiently highlighted and require further discussion/study. Let me add that these remarks are not, strictly speaking, in the nature of a dissent. The most important recommendations of this chapter are for the single new spectrum management structure, and the clear recognition of the need to bring economic factors to bear on allocation and utilization of the scarce resource. However, a stronger recommendation is warranted for study of the economic factors and means for introducing them in the allocation process. It is only during the past few years that the scarce economic resource aspects of the spectrum have been receiving serious and as yet very limited study. Study of a market system should not be dismissed, nor of the applicability of leasing, license fees, taxation, "shadow-pricing" or other alternatives. This should be one of the main charges of the new spectrum management authority.

In our view both the "improved license fee" suggestion and the "selected area" recommendations of Sections E 1 and E 2 are so overly specific as to detract from the proposal for a new system and new research for spectrum management. Inspite of the overwhelming evidence for these basic needs, many may be persuaded that the more specific remedies should be given a full try first, and again valuable time will be lost.

In Section VI, conclusion #3, we attempted several times to introduce the concept that the new agency needs not only to coordinate R&D, but also to "sponsor and conduct" a program of research and development toward overall efficient use of the spectrum. The past history and intrinsic limitations of the coordinating role in this field point to the need for a capacity in the new authority to conduct and to sponsor directly such research. The Commerce Technical Advisory Board strongly recommended such a program citing that the most serious deficiency today is the lack of adequate technical and economic information upon which to base valid judgments affecting the allocation and use of the spectrum.

Chapter IX

apter IX contains those recommendations which we most strongly pport. I do not, however, agree with the suggestion that FCC regulation e extended to all additions to common carrier plant and equipment or inter-carrier contracts. The need for, and effectiveness of, this additional jurisdiction has not been demonstrated, in my opinion. We also feel that the FCC should retain responsibility for judging between individual competing applicants for radio frequency authorization, within the allocations, allotments, etc. which have been set up by the new authority.

Sincerely yours,

Bartlett

Joseph W. Bartlett

U. S. GOVERNMENT PRINTING OFFICE : 1969 O - 351-636